THE
Schoolmaſters Aſſiſtant:
BEING A COMPENDIUM OF
ARITHMETIC,
BOTH
PRACTICAL AND THEORETICAL.
IN FIVE PARTS.
CONTAINING.

I. Arithmetic in Whole Numbers, wherein all the common Rules, having each of them a ſufficient Number of Queſtions with their Anſwers, are methodically and briefly handled.

II. Vulgar Fractions, wherein ſeveral things not commonly met with, are diſtinctly treated of, and laid down in the moſt plain and eaſy Manner.

III. Decimals, in which, among other things, are conſidered the Extraction of Roots, Intereſt, both Simple and Compound; Annuities, Rebate and Equation of Payments.

IV. A large Collection of Queſtions, with their Anſwers, ſerving to exerciſe the foregoing Rules; together with a few others, both pleaſant and diverting.

V. Duodecimals, commonly called Croſs Multiplication, wherein that ſort of Arithmetic is throughly conſidered and rendered very plain and eaſy; together with the method of proving all the foregoing Operations at once by Diviſion of ſeveral Denominations, without reducing them to the loweſt Term mentioned.

The whole being delivered in the moſt familiar way of Queſtion and Anſwer, is recommended by ſeveral eminent Mathemeticians, Accomptants, and Schoolmaſters, as neceſſary to be uſed in Schools, by all Teachers who would have their Scholars throughly underſtand, and make a quick Progreſs in ARITHMETIC.

To which is prefixed, An ESSAY on the Education of YOUTH; humbly offered to the Conſideration of PARENTS.

By THOMAS DILWORTH,

Author of the New Guide to the Engliſh Tongue; Young Book-keeper's Aſſiſtant, &c. and Schoolmaſter in Wapping.

All things, which from the very firſt original being of things, have been framed and made, do appear to be framed by the reaſon of Number: for this was the principal example or pattern in the mind of the Creator. Anitius Boetius.

Thou (O Lord) haſt ordered all things in meaſure, number, and weight. Wiſdom xi. 20.

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THE

PREFACE DEDICATORY.

To the Reverend and Worthy

SCHOOLMASTERS

IN

GREAT-BRITAIN AND IRELAND.

GENTLEMEN,

AFTER returning you my moſt hearty thanks for your kind acceptance of my New Guide to the Engliſh Tongue, permit me to lay before you the following pages, which are intended as an help towards a more ſpeedy improvement of your ſcholars in numbers, and at the ſame time, to take off that heavy burden of writing out rules and queſtions, which you have ſo long labour'd under.

I need not, I preſume, ſay any thing concerning the uſefulneſs of, and advantages that accrue to mankind in general from arithmetic, ſince they are, by this time, pretty well known; and alſo deſerve the employment of a much better pen than mine can pretend to be; but I will venture to ſay thus much, and I believe you will pardon me for it, that THIS (by putting one into each arithmetician's hand) will not only prove a kind ASSISTANT to you, but upon trial, be found at once, both to delight and improve the minds of thoſe, who are committed to your care.

I have gone through all the parts of arithmetic, commonly taught in ſchools, and have included ſeveral others no leſs uſeful: And though I have given more queſtions to work upon in each (rule which was abſolutely neceſſary; none having yet calculated their performances, of this kind, for the uſe of ſchool boys) I have endeavoured at the ſame time to reduce the whole, to as neat and portable a volume, as any that have gone before me.

I muſt confeſs, I do not propoſe by THIS to add to any maſter's knowledge in arithmetic, who I imagine, is already acquainted with every thing contained in this compendium; for which reaſon it is reduced to the narrow compaſs it now appears in, without particular directions for working the operations at large; and therefore, I conceive, here is room enough left for every man to ſpeak his own mind, and inſtruct his pupils in his own method. And,

I believe, it is confeſſed by all, that it is a taſk too hard for children to be made compleat maſters of arithmetic; and therefore the beſt way of inſtructing them in it is, moſt certainly, firſt to give them a general notion of it, in the eaſieſt manner, and next to enlarge upon it afterwards, if there be time; otherwiſe it muſt be done by themſelves, as their increaſe in years and growth in underſtanding will permit. * "For arithmetic is the more valuable, "as it is the more exact, eaſy and ſhort; and the "art lies in giving as few rules as poſſible, and clearly explaining them; and not confounding principles together, and then diverſifying them into "ſeveral rules, when they are built on the ſame reaſon, which has not only made arithmetic ſeem difficult of acceſs, but has hinder'd many from being "accomptants."

To enter into a detail of the following particulars, would be tedious, and ſwell this preface beyond its juſt limits; but that the kind reader may not be wholly at a loſs, I ſhall beg leave to ſpeak as follows, viz.

1. That

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* Watts' Eſſay.

1. That the whole is divided into five parts, as the title page expreſſes it.

2. That the rules and examples are contrived in the plaineſt manner, and the whole put in ſuch an eaſy method, as is no where elſe extant.

3. I have omitted Reduction of Foreign Coins, partly becauſe all thoſe tables, which I have met with, which ſhew the value of Foreign Coins in Engliſh Money, are very erroneous, but principally becauſe all ſuch queſtions as relate to the turning of the money of one country into that of another, are much better anſwered under the head of Exchange. For the value of foreign ſpecies (ſuch I mean as relate only to Exchange) both of gold and ſilver, in every country is unſettled, and therefore ſuch coins are ſubject to vary in their prices, as the merchants find an opportunity to profit by them. Hence proceed the various courſes of Exchange; and from them again, the particular worth of any quantity of foreign coin in Engliſh money, which is ſometimes more, and ſometimes leſs, according as the courſe of Exchange runs at that time when ſuch foreign coin becomes due. Add to this the Agio or Advance Money, uſually paid abroad on the changing Current Money into Exchange or Bank Money, which is 2, 3, or more *per cent.* in payment, according to what the Exchange or Bank Money is worth more than the Current Money, and this cannot be done otherwiſe than by the Rule of Three.

4. In Intereſt, *&c.* by Decimals, I have follow'd Mr. Ward's method, by which means the rule is drawn into a much narrower compaſs; and appears more beautiful to the eye than in words at length.

5. In all places where it could be done conveniently, I have given directions for varying the examples by way of proof; becauſe it not only diſcovers the reaſon of the operation, but at the ſame time both produces a new queſtion, and proves the old one. And ſure I am, that the varying the queſtion, when

it may be done under the ſame rule, contributes very much towards a thorough underſtanding of it, and making a good accomptant, as every one's experience will teach him.

6. I have thrown the ſubject of the following pages into a catechetical form, that they may be the more inſtructive; for children can better judge of the force of an anſwer, than follow reaſon thro' a chain of conſequences. Hence alſo it proves a very good examining book; for at any time, in what place ſoever the ſcholar appears to be defective, he can immediately be put back to that place again, without the formal way of beginning every thing anew.

7. In order to make the progreſs ſtill quicker, every example, to be wrought, hath its anſwer annexed to it: So that they who do not chuſe to have every operation proved by varying the queſtion, may know without it, whether the work be right or not.

8. Concerning contractions in numbers, which ſome are very fond of, I have ſaid very little, and my reaſon is this; Contractions are no farther valuable than they are uſeful; hence, if in order to leſſen the number of figures in an operation, there is not only more time ſpent than in the ordinary way, but thoſe contractions are alſo more liable to error, ſuch contractions ought to be rejected.

And now, after all, it is poſſible that ſome, who like beſt to tread the old beaten path, and to ſweat at their buſineſs when they may do it with pleaſure, may ſtart an objection againſt the uſe of this well-intended Aſſiſtant; becauſe the courſe of arithmetic is always the ſame; and therefore ſay, *That ſome boys lazily inclined, when they ſee another at work upon the ſame queſtion, will be apt to make his operation paſs for their own:* But theſe little forgeries are ſoon detected by the diligence of the tutor: Therefore, as different queſtions to different boys, do not in the leaſt promote their improvement: So neither do the ſame queſtions hinder it. Neither is it in the power of any maſter (in the courſe of his buſineſs) how full ſoever he be, to frame new queſtions at pleaſure in any rule, but the ſame queſtions will frequently occur in the ſame rule, notwithſtanding his greateſt care and ſkill to the contrary.

It may alſo be further objected, *That to teach by a printed book, is an argument of ignorance and incapacity*, which is no leſs trifling than the former. He indeed (if any ſuch there be) who is afraid his ſcholars will improve too faſt, will undoubtedly decry this method; but that maſter's ignorance can never be brought in queſtion, who can begin and end it readily; and moſt certainly that ſcholar's non-improvement can be as little queſtioned, who makes a much greater progreſs by this, than he poſſibly can by the common method.

As to the order of the rules, I can hardly find two maſters follow it alike; ſome liking beſt to teach that rule firſt, which another thinks more convenient to teach afterward; while a third looks upon it as a matter quite indifferent, among ſome rules, which he teaches firſt. But this need be no hindrance to the uſe of this book. For however the rules are placed here, every man may turn to that rule firſt, which he likes ſhould be taught firſt; and if a maſter has a mind to teach Vulgar Fractions immediately after Reduction of Whole Numbers, as ſome do, he may do it as eaſily, as in the order they now lie.

To the eleventh edition, and which is continued in this, I have added Duodecimals, commonly called Croſs Multiplication; wherein I have largely treated of that ſort of arithmetic, in every branch; ſhewing how the ſame may be proved by varying the operations; by whole numbers; by vulgar fractions, and by decimals: and laſtly by a particular ſort of diviſion, wherein the diviſor, dividend and quotient are, each of them, of ſeveral denominations, juſt as the Factors and Products are in Multiplication, without reducing them into the loweſt term or denomination mentioned. And as duodecimals, by all the writers that I have ſeen, except Mr. Hawney, have only been ſuperficially treated of, I think I may venture to ſay, without any breach of modeſty, that this is the compleateſt piece of that kind extant.

As a further improvement of this compendium, I have conſiderably enlarged the Rule of Exchange, and among others, have given a variety of examples of real bills of exchange, to be wrought by the pupil, in order to ſhew him, in a more particular manner, the neceſſity of knowing how to turn the money of one country into the money of another country, value for value, where the merchant happens to be engaged in foreign trade. I have alſo taken the liberty to put the Double Rule of Three after Exchange, which in moſt of the former editions ſtood before it, to the end that all the mercantile rules in whole numbers might ſtand together; and likewiſe that the pupil might, at the end of Exchange, enter upon a courſe of book-keeping, if there ſhould not be time for him to go through the whole compendium firſt.

I ſhould have been very glad to have ſeen an attempt of this nature, ſtampt by the authority of ſome perſon of diſtinction and of better abilities; but ſince no abler hand has undertaken it, I hope its homely appearance will not leſſen its uſefulneſs.

The printer's errors, as well as my own defects, I hope, will candidly be overlook'd: But becauſe a man's failings are ſo familiar to himſelf, that he can ſcarce diſcern them; therefore the kind admonitions of a good-natur'd reader, ſhall always be very acceptable.

I have nothing more to add, but my repeated thanks for favours received, together with my earneſt deſire that you may be proſperous in your ſeveral undertakings, and to beg this additional favour of being eſteemed,

GENTLEMEN,
Your moſt humble, and
moſt obedient Servant,
THOMAS DILWORTH.

ON THE
EDUCATION OF YOUTH,
AN
ESSAY.

Humbly offer'd to the Conſideration of

PARENTS.

THE right education of children, is a thing of the higheſt importance, both to themſelves and the commonwealth. It is, this, which is the natural means of preſerving religion and virtue in the world: And the earlier good inſtructions are given, the more laſting will be their impreſſion. For it is as unnatural to deny theſe to children, as it would be to with-hold from them their neceſſary ſubſiſtence. And happy are thoſe, who, by a religious education and watchful care of their parents, their wiſe precepts and good examples have contracted ſuch a love of virtue and hatred of vice, as to be removed out of the way of temptations. And 'tis owing to the want of this education, that many, when they leave their ſchools, do not prove ſo well qualified as might be expected. This great omiſſion being, for the moſt part, chargeable on the parents, I hope the following particulars (which are the common voice of our profeſſion) will not be taken amiſs. And,

1. A conſtant attendance at ſchool is one main axis whereon the great wheel of education turns. Therefore if that obſervation, which is commonly made by parents be

true, *That the maſters have holidays enough of their own making*, there is, by their own confeſſion, no neceſſity for them to make an addition.

2. Parents ſhould never let their own commands run counter to the maſter's, but whatever taſk he impoſes on his pupils, to be done at home, they ſhould be careful to have it perform'd in the beſt manner, in order to keep them out of idleneſs. * "For vacant hours move on heavily, and drag ruſt and filth along with them: and 'tis full employment, and a cloſe application to buſineſs, that is the only barrier to keep out the enemy, and ſave the future man."

3. Parents themſelves ſhould endeavour to be ſenſible of their childrens defects and want of parts; and not blame the maſter for neglect, when his greateſt ſkill, with ſome will produce but a ſmall ſhare of improvement. But the great misfortune is, as the proverb expreſſes it; *Every bird thinks her own young the faireſt.* And the tender mother, tho' her ſon be of ungovernable temper, will not ſcruple to ſay, *He is a meek child and will do more with a word than a blow*, when neither words nor blows are available. On the other hand, ſome children are of a very dull and heavy diſpoſition; and are a long time in gathering but a little learning, and yet their parents think them as capable of inſtruction, as thoſe, who have the moſt bright and promiſing parts: And when it happens that they improve but ſlowly, tho' it be in proportion to their own abilities, they are hurried about from ſchool to ſchool, till at laſt they loſe that ſhare of learning, which otherwiſe by ſtaying at the ſame ſchool, they might have been maſters of. Juſt like a ſick, but impatient man, who employs a phyſician to cure him of his malady; and then, becauſe the diſtemper requires time as well as ſkill to procure his health, tells him, *He has all along taken a wrong method;* turns him off, and then applies to another, whom he ſerves in the ſame manner; and ſo proceeds till the diſtemper proves incurable.

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* Watts' Eſſay.

4. It is highly neceſſary that children ſhould be early made ſenſible of the ſcandal of telling a lie: To this end parents muſt inculcate upon them betimes that moſt neceſſary virtue of ſpeaking truth, as one of the beſt and ſtrongeſt bands of human ſociety and commerce, and the foundation of all moral honeſty.

5. Injuſtice (I mean the tricking each other in trifles, which ſo frequently happens, among children, and is very often countenanced by the parents, and looked on as the ſign of a very promiſing genius) ought to be diſcouraged betimes, leſt it ſhould betray them into that vile ſin of pilfering and purloining in their riper years; to which the grand enemy of mankind is not wanting to prompt them by his ſuggeſtions, whenever he finds their inclinations have a tendency that way.

6. Immoderate anger and deſire of revenge, muſt never be ſuffered to take root in children. For (as a moſt reverend divine obſerves) * "If any of theſe be "cheriſhed, or even let alone in them, they will, in a "ſhort time, grow headſtrong and unruly; and when "they come to be men, will corrupt the judgment, turn "good nature into humour, and underſtanding into pre-"judice and wilfulneſs."

7. Children are very apt to ſay at home what they ſee and hear at ſchool, and oftentimes more than is true; and ſome parents, as often, are weak enough to believe it. Hence ariſe thoſe great uneaſineſſes between the parents and the maſter, which ſometimes are carried ſo high, as for the parent, in the preſence of the child, to reproach him with hard names, and perhaps with more abuſeful language. On the contrary,

8. If parents would have their children improve in their learning, they muſt cauſe them to ſubmit to the little (imaginary) hardſhips of the ſchool, and ſupport them

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* Abp. Tillotſon.

them under them by ſuitable encouragements. They ſhould not fall out with the maſter upon every idle tale, nor even give their children the liberty of expreſſing themſelves that way; but they ſhould, by all means, inform them frequently, "That they ought to be good boys, "and learn their book, and always do as their maſter "bids them, and that of they do not, they muſt undergo "the pain of correction." And it is very obſervable what a harmony there is between the maſter and the ſcholar, when the latter is taught to love and have a good opinion of the former; and then with what eaſe does the ſcholar learn! With what pleaſure does the maſter communicate!

9. The laſt thing that I ſhall take notice of is, That while the maſter endeavours to keep peace, good harmony and friendſhip among his ſcholars, they are generally taught the reverſe at home. * "It is indeed but too common "for children to encourage one another, and be encouraged by their friends in that ſavage and brutal way "of contention, and to count it a hopeful ſign of mettle "in them to give the laſt blow, if not the firſt, wherever they are provoked: forgetting at the ſame time, "that to teach children betimes to love and be good natured to others, is to lay early the true foundation of "an honeſt man. Add to this, that cruel delight which "ſome are ſeen to take in tormenting and worrying ſuch "poor animals and inſects as have the misfortune to fall "into their hands. But children ſhould not only be "reſtrained from ſuch barbarous diverſions, but ſhould "be bred up from the beginning to an abhorrence of "them." And at the ſame time be taught that great rule of humanity, *To do to others as we would they ſhould do to us*.

From what has been ſaid relating to the management of children at home, the neceſſity of the parents joining hands with the ſchoolmaſter appears very evidently. For when the maſter commands his pupils to employ their leiſure time in getting ſome neceſſary parts of learning, their friends ſhould not command them to forbear: And when they ought to be at ſchool at the ſtated hours, they ſhould not be ſent an hour or two after, in the time of health, ſometimes with a lie in their lips to excuſe their tardineſs; and ſometimes with an order and a brazen front, to tell their maſter, *Their friends think it time enough to come to ſchool at nine in the morning, becauſe the weather is a little cold, or becauſe they muſt have their breakfaſt firſt.* I ſay parents ſhould not act ſo indiſcreetly, becauſe it clips the wings of the maſter's authority: It makes boys firſt deſpiſe and undervalue their teachers, and then become unmannerly and impertinent to them; correction for which, makes the tutor hated by the children, and then there naturally follows either a total diſregard to buſineſs, or a general careleſſneſs in every thing they do. And,

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* Talbot's Chriſtian Schoolmaſter.

While I am ſpeaking of the education of children, I hope I ſhall be forgiven, if I drop a word or two relating to the fair ſex.—It is a general remark that they are ſo unhappy as ſeldom to be found either to ſpell, write, or cypher well: And the reaſon is very obvious; becauſe they do not ſtay at their writing ſchools long enough. A year's education in writing is, by many, thought enough for girls; and by others it is thought time enough to put them to it, when they are eighteen or twenty years of age; whereas by ſad experience, both theſe are found to be, the one too ſhort a time, and the other too late. The firſt is a time too ſhort, becauſe, when they are taken from the writing ſchool, they generally forget what they learnt, for want of practice: And the other too late, becauſe then they are apt to look too forward, imagine all things will come of themſelves without any trouble, and think they can learn a great deal in a little time; and when they find they cannot compaſs their ends ſo ſoon as they would, then every little difficulty diſcourages them: And hence it is that adult perſons, ſeldom improve in the firſt principles of learning ſo faſt as younger ones. For a proof of this, I appeal to every woman, whether I am juſt in my ſentiments or not. The woman who has had a liberal education this way, knows the advantages that ariſe from the ready uſe of the pen; and the woman who has learnt little or nothing of it, cannot but lament the want of it. Girls therefore ought to be put to the writing-ſchool as early as boys, and continued in it as long, and then it may reaſonably be expected that both ſexes ſhould be alike ready at their pen. But for want of this, how often do we ſee women, when they are left to ſhift for themſelves in the melancholy ſtate of widowhood (and what woman knows that ſhe ſhall not be left in the like ſtate?) obliged to leave their buſineſs to the management of others; ſometimes to their great loſs, and ſometimes to their utter ruin; when on the contrary had they been ready at their pen, could ſpell well, and underſtand figures, they might not only have ſaved themſelves from ruin, but, perhaps, have been miſtreſſes of good fortunes. Hence then may be drawn the following, but moſt natural concluſion, viz. * " The education of " youth is of ſuch vaſt importance, and of ſuch ſingular " uſe in the ſcene of life, that it viſibly carries its own " recommendation along with it: For on it, in a great " meaſure, depends all that we hope to be; every per- " fection that a generous and well diſpoſed mind would " gladly arrive at: 'Tis this that ſtamps the diſtinction " of mankind, and renders one man preferable to ano- " ther: Is almoſt the very capacity of doing well; and " remarkably adorns every point of life." And as the great end of human learning is to teach a man to know himſelf, and thereby fit him for the kingdom of heaven: So he that knows moſt, conſequently is enabled to practice the beſt, and become an example to thoſe who know but little, or are quite ignorant of their duty. I am,

Your and your childrens well-wiſher,

THOMAS DILWORTH.

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* Watt's Eſſay.

TO
Mr. THOMAS DILWORTH,
On his Compendium of
ARITHMETIC,
INTITLED
The Schoolmaſters Aſſiſtant.

WHILE ſome, ſeducive of the riſing age,
Expoſe for hire the lewd and factious page,
On every ſtall appear the public peſt,
Deep bane inſtilling in the tender breaſt;
Thou, friend of moral as of ſocial truth!
Employ'ſt thy toils to mend our growing youth.
Thy cares, how worthy of the good and wiſe,
Impow'r the embrio genius firſt to riſe;
Make the dark clues of Science plain to find,
And thro' its mazes lead the pleaſur'd mind.
E'en now afreſh, unweary'd in thy pains,
For future times thy recent taſk remains:
By double motives it aſſures to pleaſe,
The Youth's inſtructor, and the Tutor's eaſe:
From darker forms it clears encumber'd rules,
And learning makes the fit delight of ſchools.
Thy labours, Friend, have found their juſt ſucceſs,
And gen'ral plaudits thy deſert confeſs,
O may THIS WORK, nor THIS be found thy laſt,
No ſordid Pride o'erlook, or Envy blaſt,
Far as our mother-tongue extends be known,
And grateful Pupils thy aſſiſtance own.

MOSES BROWNE.

TO

MR. THOMAS DILWORTH,

ON HIS

SCHOOLMASTERS ASSISTANT.

DILWORTH, the man by gracious Heav'n deſign'd,
A Friend, a Father to the human kind;
Whoſe active diligence, and warmer zeal
United, centre in the Public Weal!
Fain wou'd my Muſe diſcharge the debt of praiſe,
With freſh additions to thy circling bays.
LEARNING, the glory of Britannia's iſle,
Within thy fav'rite leaves is taught to ſmile;
No more perplex'd in Error's maze we run,
And meet the danger, which we ſought to ſhun;
Since, drawn by thee, now ſhines before our eyes
The path where Virtue and fair Knowledge lies:
There waits a * Guide, by niceſt model plann'd,
Here ſtands an Uſher with aſſiſting hand;
A work ſo clear, delighted we purſue,
And think the pleaſing proſpect ever new.
So the kind Sun, with all-reviving ray,
Clears the dark world with an approaching day:
Before his light the empty ſhadows fly,
And Nature glows with a ſerener ſky.

WILLIAM DEANE.

Halifax, *Oct*. 20. 1765.

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* Referring to that of the Engliſh Tongue.

To Mr. Thomas Dilworth, Author of the Schoolmaſters Aſſiſtant.

SIR,

AS you was pleaſed to favour me with the peruſal of your Schoolmaſters Aſſiſtant in manuſcript, which gave me a ſenſible pleaſure: You have thereby obliged me, in juſtice to your merit, to give my humble opinion upon it.—That a Work of this kind has been long wanted, admits of no diſpute: And I muſt confeſs, that you have treated the Subject ſo methodically, laid down the ſeveral Rules ſo very plain, yet conciſe, as muſt make this Book of general uſe and advantage: And I heartily wiſh you may meet with equal encouragement in the publication of this, as you did in your excellent New Guide to the Engliſh Tongue. I am,

SIR,

London, 29*th* of *November*, 1743.

Your ſincere Friend,

And humble Servant,

BRIGHT WHILTON.

To Mr. Thomas Dilworth, on his Schoolmaſters Aſſiſtant.

SIR,

I HAVE peruſed, with pleaſure, your Schoolmaſters Aſſiſtant, and give you my thanks for your kind endeavours to further the Improvement of Youth with greater facility to the Tutor.

I am convinced, that Piece is well calculated to promote both, and therefore wiſh you the ſucceſs due to ſo much uſeful Labour. I am,

SIR,

Twelve-Bell-Court, in Bow-Church-Yard, 13. *Jan.* 1743.

Your Friend and Servant,

WILLIAM COLES.

To Mr. Thomas Dilworth, on his Treatiſe of ARITHMETIC, intitled, The Schoolmaſters Aſſiſtant.

S I R,

IT is univerſally allow'd (in all nations civiliz'd) that the Inſtruction of Youth is of the greateſt importance; the happineſs of every individual, and ſociety in general thereon depending; and that it is of two kinds, viz. To form the good man and the good ſcholar. To compleat the latter, thoſe Studies are chiefly to be purſu'd, which are adequate to the diſpoſition of the pupil, and to compleat the man of buſineſs he is deſign'd for: But I do not know any buſineſs that can be well executed without ARITHMETIC. This therefore claims the firſt place, and due care of the maſter, to inculcate and explain its rudiments, which not only ground the Tyro, but alſo give him ſome glances of thoſe beauties and uſes, he may expect from his preſent labours: Every help then, that may gain the maſter time in the diſcharge of his duty, will (in conſequence) add to the improvement of his ſcholars: For which uſe and purpoſe, that THIS BOOK is well adapted (having perus'd it ſome time ago in manuſcript) is the ingenuous opinion of, S I R,

Gainſford-ſtreet, Shad-Thames, Southwark, the 9. *of May*, 1743.

Your reſpectful friend and ſervant,

WILLIAM MOUNTAINE.

To Mr. Thomas Dilworth, Author of the Schoolmaſters Aſſiſtant.

S I R,

I HAVE perus'd your Book, intitled, The Schoolmaſters Aſſiſtant, and readily recommend it as a proper Companion, for ſuch as are employ'd in teaching ARITHMETIC, as well as for thoſe who are deſirous of improvement in that uſeful and neceſſary Science. I am, S I R,

The Academy in Little Tower-Street, March 29. 1744.

Your humble Servant,

EM. AUSTIN.

WE, whoſe Names are underwritten, having peruſed this Book, intitled, *The Schoolmaſters Aſſiſtant*, do recommend it to be uſed in Schools, for the ſpeedy Improvement of *Youth* in *Arithmetic*, as the only one for that purpoſe, that hath yet been made public.

Charles Bellenger, M. A. Lecturer of Trinity Minories, and maſter of the free ſchool belonging to the Worſhipful Company of Brewers, London.

James Dalton, M. A. maſter of the boarding-ſchool at Stanmore, in Middleſex.

The Rev. Mr. Joſeph Wilſon, maſter of the free-ſchool at Nether Kebworth, in Lieceſterſhire.

The Rev. Mr. Richard Wilſon, maſter of the free-ſchool at Rutterworth, in Lieceſterſhire.

The Rev. Mr. Robert Wilſon, maſter of the free-ſchool at Warbleton, in Suſſex.

Francis Chapman, writing-maſter and accomptant in Shadwel.

Francis Hopkins, writing-maſter and accomptant, in Cavendiſh-Court, near Devonſhire Square.

John Loveday, ſchoolmaſter, at Stepney.

Ebenezer Bramble, maſter of a boarding-ſchool in New Brentford.

William Mercer, writing-maſter at Maidſtone.

William Tully, maſter of the boarding-ſchool at Stanmore, in Middleſex.

John Thorpe, writing-maſter and accomptant at St. Edmund's Bury, Suffolk.

Thomas Evans, ſchoolmaſter at Hampſtead.

Richard Aſtell, writing-maſter at Epſom.

Robert Pierſon, ſchoolmaſter in Redcroſs-ſtreet.

John Richardſon, ſchoolmaſter by London-Wall.

George Watts, ſchoolmaſter in Penny-Fields, Poplar.

Auguſtine Gradwell, maſter of Mr. Worral's free-ſchool in Cherry-Tree-Alley, Golden-Lane, St. Luke's.

John Tuckett, writing-maſter and teacher of the mathematics, at the Hand and Pen and Globe in New-ſtreet, near Fleetſtreet.

George Caffey, ſchoolmaſter in Whitechapel.

Edward Rayne, maſter of the Haberdaſhers ſchool at Hoxton.

John Shortland, ſchoolmaſter in St. Ann's-Lane, near Alderſgate.

Francis Cartwright, ſchoolmaſter near Shoreditch-church.

William Paulſon, ſchoolmaſter in Norton-Falgate.

Jeremiah Walker, writing-maſter and accomptant, in Old-Gravel-Lane, near Ratcliff Highway.

Henry Maſon, ſchoolmaſter at

St George's Church, Southwark.

Henry Longman, ſchoolmaſter in Fitcher's-Court, Noble-ſtreet, near Cripplegate.

John Day, writing-maſter and accomptant, at Doctors-Commons.

Thomas Young, ſchoolmaſter in St. Margaret's, Weſtminſter.

John Davis, teacher of the mathematics, in Old Paradiſe-ſtreet, Rotherhithe.

Joſeph Miller, ſchoolmaſter in Street-lane, near Hutherſfield, Yorſhire.

John Parſons, writing-maſter and accomptant, in Penny-Field, Poplar.

Eraſmus Carter, ſchoolmaſter at Newington.

Henry Michon, ſchoolmaſter in Red-Lion-Market, near Golden-lane.

John Wingfield, ſchoolmaſter in Bull and Mouth-ſtreet, near Alderſgate.

Joſeph Allen, ſchoolmaſter and accomptant in White-croſs-ſtreet.

Joſeph Beaſing, writing-maſter and accomptant, at Cheſhnut in Hertfordſhire.

John Canton, M. A. maſter of the academy in Spital-ſquare.

Joſeph Winder, maſter of the Grammar-ſchool in Coleman-ſtreet.

Charles Delafoſſe, maſter of a boarding-ſchool at Richmond, Surry.

Daniel Kitchen, ſchoolmaſter at Biſhop-Burton, near Beverley, in Yorſhire.

Robert Sawell, maſter of the boarding-ſchool, at Aſpley, near Woborn, Bedfordſhire.

Charles Morton, teacher of the mathematics, in the Rectory Houſe of St. Leonard, Shoreditch.

Samuel Godier, teacher of the Claſſics, near the church, Spital-Fields.

Robert Smith, writing-maſter and accomptant, at Richmond, Surry.

William Shemeld, writing-maſter and accomptant at Hampſtead in Middleſex.

Dennis Metherington, ſchoolmaſter at Marſton in Lincolnſhire.

Robert Amoſs, writing-maſter and accomptant in Ratcliff-highway, St. George's, Middleſex.

Henry Andrews, philomath, ſchoolmaſter at Royſton in Hertfordſhire.

Abraham Crocker, ſchoolmaſter at South Petherton, Somerſet.

Nathaniel Wurteen, ſchoolmaſter at Philadelphia.

John Bredel, teacher of the French and Engliſh Languages, in Spital-Field.

The TABLE of CONTENTS.

PART I.

Of WHOLE NUMBERS.

Page.
THE Introduction 1
Of Notation 2
Of Addition — 4
Of Subtraction — 21
Of Multiplication 26
Of Diviſion — 31
Of Reduction — 34
Of the Single Rule of Three Direct 44
———— *Inverſe* - 47
Of Practice - - 49
Of Simple Intereſt - 62
———— *for Days* - 67
Of Compound Intereſt 68
Of Rebate or Diſcount 69
Of Equation of Payments; the common Way - - - 70
Of Barter - - 72
Of Loſs and Gain - 73

Page.
Of Simple Fellowſhip 73
Of Compound Fellowſhip 75
Of Exchange - - 76
Of the Compariſon of Weights and Meaſures 91
Of the Double Rule of Three - - 91
Of Conjoin'd Proportion 93
Of Alligation Medial - 94
———— *Alternate* 96
Of Single Poſition - 102
Of Double Poſition - 103
Of Comparative Arithmetic - - 104
Of Progreſſion Arithmetical - - - 105
———— *Geometrical* 107
Of Permutation, or changing the Order of Things - 109

PART II.

Of VULGAR FRACTIONS.

OF Notation - 111
Of Reduction 111
Of Addition - 118
Of Subtraction - 118
Of Multiplication - 119
Of Diviſion - - 120
Of the Single Rule of Three Direct 121
———— *Inverſe* - 122
Of the Double Rule of Three 122

PART III.

Of DECIMAL FRACTIONS.

Page.
Of Notation - 123
Of Addition - 124
Of Subtraction - 125
Of Multiplication - 125
Of Diviſion - - 126
Of Reduction - 126
Of the Single Rule of Three Direct 129
Of Converging Series, viz.
Of the ſquare Root 131
——— *of a Vul. Fract.* 132
——— *of a mixt Num.* 132
Of the Cube Root - 133
——— *of a Vul. Fract.* 136
——— *of a mixt Num.* 136
Of a Biquadrate Root 137
Of the Surſolid Root 137
Of the ſquare Cube Root 139
Of the ſecond Surſolid Root - - 139
Of the ſquare Biquadrate Root - 139
Of the Cubed Cube Root 140
Of the ſquare Surſolid Root - - 140
Of the third Surſolid Root - - 140
Of the ſquared ſquare Cube Root - 141
Page.
A general Rule for extracting the Roots of all Powers - 141
Of Simple Intereſt 143
Of Annuities and Penſions in Arrears 146
Of the preſent Worth of Annuities - 148
Of Annuities and leaſes in Reverſion 151
Of Simple Intereſt for Days - - 153
Of Rebate or Diſcount 154
Of Equation of Payments; the true Way 155
Of Compound Intereſt 156
Of Annuities and Penſions in Arrears 158
Of the preſent Worth of Annuities 159
Of Annuities and leaſes in Reverſion 161
Of purchaſing freehold or real Eſtates 164
Of purchaſing freehold Eſtates in Reverſion - - 165
Of Rebate or Diſcount 166
To find the Value of Timber 168

PART IV.

QUESTIONS.

A Collection of Queſtions to exerciſe the foregoing Rules 169
A ſhort Collection of pleaſant and diverting Queſtions 170

PART V.

Of DUODECIMALS.

Addition - 181
Subtraction - 182
Multiplication - - 182
Diviſion - - 190

The Explication of ſome MARKS uſed in this COMPENDIUM.

$=$ TWO parallel Lines are the marks of Equality; as 12 *oz.* $=$ 1 *lb.* ſignifies that 12 Ounces are equal to 1 Pound.

$+$ Saint George's Croſs ſignifies more, or Addition; as $4 + 2 = 6$: *i. e.* 4 more 2, are equal to 6.

$-$ A ſtraight Line ſignifies leſs, or Subtraction; as, $4 - 2 = 2$: *i. e.* 4 leſs 2, are equal to 2.

$\times$ Saint Andrew's Croſs denotes Multiplication; as, $4 \times 2 = 8$: *i. e.* 4 multiplied by 2, are equal to 8.

$\div$ $\because\!\!-$ A Line between two Points, or between four Points, is the ſign of Diviſion; as, $4 \div 2$ or $4 \because\!\!- 2 = 2$: *i. e.* 4 divided by 2, are equal to 2.

)(The reverſed Parentheſis denotes Diviſion alſo; as, 2)4(2: *i. e.* 4 divided by 2 is equal to 2.

$4\frac{76}{32}1$ Numbers placed in a fraction-like manner, do likewiſe denote Diviſion; the lower Number being the Diviſor, and the upper Number the Dividend.

: : Four Points, ſet in the middle of four Numbers, denote them to be proportional to one another, by the Rule of Three; as, 2 . . 4 : : 8 . . 16: that is, as 2 is to 4, ſo is 8 to 16.

N. B. Some Maſters, inſtead of Points, uſe long Strokes to keep the Terms ſeparate, but it is wrong to do ſo; for the two Points between the firſt and ſecond Terms, and alſo between the third and fourth Terms, ſhew that the two firſt, and the two laſt Terms are in the ſame proportion. And whereas four Points are put between the ſecond and third Terms, they ſerve to disjoint them, and ſhew that the ſecond and third, and firſt and fourth Terms are not in the ſame direct Proportion to each other as are thoſe before mentioned.

Money.

£. Libræ, Pounds.
S. Solidi, Shillings.
D. Denarii, Pence.
Qrs. Quadrantes, Farthings.

$\overline{2 + 3} \times 5 = 25$, Signifies that the Sum of 2 and 3 multiplied by 5, is equal to 25.

$\overline{3 - 2} \times 5 = 5$, Signifies that the difference between 3 and 2, multiplied by 5, is equal to 5.

$\surd$ or $\surd q$. Prefixt to any Number, ſuppoſes that the Square-Root of that Number is required. Sometimes it is the ſign of Irrationality, and ſignifies that the Square-Root of ſuch a Number can never be truly found.

$\surd c$. Prefixt to any Number, ſuppoſes that the Cube-Root of that Number is required. Sometimes it is the ſign of Irrationality, and ſignifies that the Cube-Root of ſuch a Number can never be truly found.

$3aa+3a$, Signifies 3 times the Square of a, more 3 times a.

$3aae+3eea+eee$, Signifies 3 times the Square of a, multiplied by e; more 3 times the Square of e, multiplied by a; more the Cube of e, as in the Cube-Root.

THE

Schoolmaſters Aſſiſtant:

PART. I.

Of Arithmetic in Whole Numbers.

The INTRODUCTION.

Of Arithmetic in General.

Q. *WHAT is Arithmetic?*

A. Arithmetic is the Art or Science of computing by Numbers, either whole or in Fractions.

Q. *What is Number?*

A. Number is one or more Quantities, anſwering to the Queſtion, *How many?*

Q. *What is Arithmetic in Whole Numbers?*

A. Arithmetic in Whole Numbers, or Integers, ſuppoſes its Numbers to be entire Quantities, and not divided into Parts.

Q. *What is Arithmetic in Fractions?*

A. Arithmetic in Fractions, ſuppoſes its Number to be the Parts of ſome entire Quantity.

Q *How do you conſider Arithmetic with regard to Art and Science?*

A. Both in Theory and Practice.

Q. *What is Theoretical Arithmetic?*

A. Theoretical Arithmetic conſiders the Nature and Quality of Numbers, and demonſtrates the Reaſons of Practical Operations. And in this Senſe Arithmetic is a Science.

Q. *What is Practical Arithmetic?*

A. Practical Arithmetic is that which ſhews the Method of working by Numbers, ſo as may be moſt uſeful and expeditious for Buſineſs. And in this Senſe Arithmetic is an Art.

Q. *What is the Nature of all Arithmetical Operations?*

A. The Nature of all Arithmetical Operations is by ſome Quantities that are given, to find out others that are required.

Q. *Which are the fundamental Rules in Arithmetic?*

A. Theſe five; *Notation*, *Addition*, *Subtraction*, *Multiplication*, and *Diviſion*.

Of NOTATION.

Q. W*HAT is Notation?*

A. It is the Art of expreſſing Numbers by certain Characters or Figures.

Q. *What is the Uſe of Notation?*

A. Notation teaches to read and write Numbers by their true Value.

Q. *How many Sorts of Characters or Figures are Numbers uſually expreſſed by?*

A. Two, *viz.* The Arabic Figures and the Latin Letters.

Q. *How are the Arabic Figures expreſs'd?*

A. The Arabic Figures are thus expreſs'd; One 1, Two 2, Three 3, Four 4, Five 5, Six 6, Seven 7, Eight 8, Nine 9, Nought or Cypher 0. And this is the Notation or reading and writing of every ſingle Figure.

Q. *How far may the Uſe of theſe Figures be extended?*

A. Theſe ten Characters or Figures may be uſed to expreſs all manner of Numbers, from the leaſt to the greateſt, that can be conceived; even without End.

Q. *How many Figures are ſufficient to expreſs moſt ordinary Concerns?*

A. Nine; and therefore the Table of Notation commonly extends no farther than to nine Places.

Q. *Why does it conſiſt of nine Places rather than of eight or ten?*

A. Becauſe they make up three even Periods.

Q. *What do you mean by a Period?*

A. A Period is a Quantity expreſs'd by three Figures, whereof the firſt to the right Hand ſignifies ſo many Units or ſingle things: the ſecond ſo many tens; and the third ſo many hundreds.

Q. *Why are three Figures called a Period?*

A. Becauſe if the Number be increaſed above three Places, there is ſtill the ſame periodical Return of the Value of thoſe Places, and every third Figure to the left Hand, will always be Hundreds, if it be never ſo far extended.

Q. *Is an Unit or One, a Number?*

A. An Unit is a Number, becauſe it may properly anſwer the Queſtion, *How many?*

Q. *Give an example or two?*

A. How many Gods do we believe? The Anſwer is, *One.* How many Sundays in the Compaſs of a Week? Anſwer *One.*

Q. *In what Nature or Proportion of Value, do Numbers increaſe from the Unit's Place to the left Hand?*

A. By Tens.

Q. *How muſt they be read?*

A. From the left to the right Hand.

Q. *If two Figures are given to be read together, how muſt they be valued?*

A. The firſt Figure towards the right Hand is Units, and the next to that is ſo many Tens; as 89, *Eighty-nine.* Where 9 is in the Place of Units, and 8 is in the Place of Tens; for 8 Tens are properly called Eighty.

Q. *If three Figures or a whole Period be given, how is it to be valued?*

A. Beginning at the laſt Figure on the right Hand I value them *Units, Tens, Hundreds;* as 789, *Seven Hundred* and *Eighty-nine.*

Note 1. *As every third Figure from the Place of Units, bears the Name of Hundreds: So for any great Sum to be diſtinguiſhed into Periods (as in the ſollowing Tables) will be of good Uſe to the Learner, in the eaſier valuing and expreſſing that Sum.*

2. *There is alſo another ſort of Periods, which ſome diſtinguiſh thus,* viz. *Millions, Millions of Millions,* &c. *and others thus,* viz. *Millions, Billions, Trillions,* &c *each Period conſiſting of 6 Places, but as Periods of this Kind ſeldom or never occur in Buſineſs, it is ſufficient only to mention them in this Place, without ſaying any thing further about them*

TABLE I.

Third Period.			Second Period.			First Period.		
C. Millions	*X. Millions*	*Millions*	*C. Thouſands*	*X. Thouſands*	*Thouſands*	*Hundreds*	*Tens*	*Units*
								9
							8	9
						7	8	9
					9	7	8	9
				8	9	7	8	9
			7	8	9	7	8	9
		9	7	8	9	7	8	9
	8	9	7	8	9	7	8	9
7	8	9	7	8	9	7	8	9

TABLE II.

Third Period.			Second Period.			Firſt Period.		
C. Millions	*X. Millions*	*Millions*	*C. Thouſands*	*X. Thouſands*	*Thouſands*	*Hundreds*	*Tens*	*Units*
								4
							7	3
						9	6	5
					3	4	7	2
				4	8	9	1	3
			7	3	1	2	3	6
		3	1	2	7	1	4	8
	4	3	1	9	2	7	6	4
5	7	3	1	2	9	8	4	2

Note, *See the Notation of Numbers by Latin Letters, in the New Guide to the Engliſh Tongue,* p. 88.

EXAMPLES for PRACTICE.

Write down in proper Figures the following Numbers, viz.

Twenty-nine.

Three Hundred and forty eight.

Seven Thouſand two hundred and twenty-ſix.

One thouſand, three hundred and ninety.

Nineteen Thouſand, ſeven Hundred and twenty eight.

Four Hundred and twenty-ſeven Thouſand, three Hundred and ninety ſix.

Nine Hundred and forty-two Thouſand, ſeven Hundred.

Four Millions, ſeven Hundred and eighty nine Thouſand, three hundred and twenty-eight.

Seven Millions, nine Hundred and forty-two Thouſand, four Hundred and ſeventy-five.

Twenty-ſix Millions, three Hundred and fourteen Thouſand, one Hundred and ninety five.

One Hundred and ninety-ſeven Millions, four Hundred and thirty-ſix Thouſand, one Hundred and ninety-one.

Seven Hundred and fourteen Millions, one Hundred and nineteen Thouſand, ſeven Hundred and four.

Write down in Words at length the following Numbers, viz.

7——19——846——7428——61261——370131——7126172——74680218——461272615.

Of ADDITION.

Q. WHAT *is the Uſe of Addition?*

A. Addition teacheth to bring ſeveral particular Numbers into one total Sum.

Q. *How many ſorts of Addition are there?*

A. Two, *viz.* Simple and Compound.

Of Simple ADDITION.

Q. *What is Simple Addition?*

A. Simple or Single Addition, is the adding of ſeveral Numbers together, whoſe Signification is the ſame; as 6 Yards and 8 Yards make 14 Yards.

Q. *If ſeveral Numbers are given to be added into one Sum, how are they to be placed?*

A. They muſt be placed in ſuch manner, that Units may ſtand under Units; Tens under Tens, *&c.* Pounds under Pounds; Shillings under Shillings, *&c.*

Q. *How do you prove Addition?*

A. The beſt Way of proving Addition is to begin at the top of the Sum, and reckon the Figures downward in the ſame manner that they were added upward; and if the ſecond Line or Sum Total be equal to the firſt, it is right.

EXAMPLES for PRACTICE.

£.	Yds.	Gals.	Tons.	Hhds.	lb.
4	43	764	3746	47476	461743
7	17	147	7416	73712	761710
3	19	348	3406	31819	476312
2	13	736	7278	41243	126712
1	37	197	3173	71208	310748
7	46	473	4731	70956	376880
6	46	458	7686	78647	767478
4	59	483	4768	76908	806776
7	94	367	6786	46780	468974

Miles.	Leagues.	Years.
4678943	56478076	467306042
3467890	46798067	809764689
4078496	78609480	493670846
7364706	30487674	709486704
3780670	48760963	708764047
4764846	38479068	837460985
4869704	80767047	487069868
3687670	48367808	807694674
7684078	47805747	486479870

Of Compound ADDITION.

Q. *What is Compound Addition?*

A. Compound Addition is the adding of ſeveral Numbers together, having divers Denominations.

Of MONEY.

Q. *What are the Denominations of Engliſh Money?*

A. 4 Farthings make 1 Penny
12 Pence — 1 Shilling
20 Shillings — 1 Pound Sterling.

Q. *Are there no other Names of Money uſed in England?*

A. Yes, ſuch as,

		£.	s.	d.
A Moidore	=	1	7	0
A Guinea	=	1	1	0
A Half Guinea	=	0	10	6
A Crown	=	0	5	0
A Half Crown	=	0	2	6

N. B. There are alſo ſeveral ſmaller Pieces which ſpeak their own Value, as a Six pence, Four-pence, Two-pence, Penny, Halfpenny, and Farthing.

Note, *The following Pieces were formerly current, but now not ſo, being only imaginary.*

		£.	s.	d.			£.	s.	d.
A Jacobus	=	1	5	0	A Mark	=	0	13	4
A Carolus	=	1	3	0	An Angel	=	0	10	0
					A Noble	=	0	6	8

The Pound Sterling is alſo an imaginary ſum.

Q. *Are there not ſome Tables that may be learnt by Heart?*

A. Yes; theſe following, called Pence tables.

d.		s.	d.	s.		d.
20	=	1	8	2	=	24
30	=	2	6	3	=	36
40	=	3	4	4	=	48
50	=	4	2	5	=	60
60	=	5	0	6	=	72
70	=	5	10	7	=	84
80	=	6	8	8	=	96
90	=	7	6	9	=	108
100	=	8	4	10	=	120
110	=	9	2	11	=	132
120	=	10	0	12	=	144

Note 1. Tho' I ſay theſe Tables may be learnt by heart, I do not ſay they *muſt*, for then, by the ſame Rule, it would be neceſſary to have Tables to every Rule in Addition, which no body uſes, and not every one Pence Tables; becauſe when they are learnt never ſo perfectly, their Uſe extends no further than Money; and therefore, they may very well be omitted, and a better method ſubſtituted in their room; I mean that of *Pointing*, which I am ſure, is both eaſier and ſafer to Beginners eſpecially. However, I choſe to ſet them down in their Place, that they who approve of them, may uſe them, and they who do not can eaſily omit them.

2. As all the Parts of Addition are built upon the ſame Reaſon; ſo the method of Pointing may ſerve as a general Rule, when any Denomination is to be added; and this may be done without defacing the Figures.

EXAMPLES.

£.	s.	d.
4	3	6
1	7	8¼
2	7	5
1	9	4½
3	1	3¼
1	2	1
4	7	6½
3	1	9

£.	s.	d.
1	1	3
4	8	1½
2	1	6
3	2	7½
1	2	5
3	2	8¼
7	5	6
4	1	7½

£.	s.	d.
4	1	6½
1	2	7
3	1	4¼
3	3	5
1	5	2½
4	5	6
1	5	8½
3	1	1

£.	s.	d.
14	12	1
17	11	2½
19	12	1¼
16	13	1¾
12	14	6
14	12	7½
19	13	4
12	11	7

£.	s.	d.
19	13	4
12	11	6
17	14	1¼
19	13	4½
12	11	6
19	13	2¾
16	12	1
19	11	5½

£.	s.	d.
47	12	11
17	10	11
17	10	4½
31	12	5
11	19	5
12	12	6½
25	10	5
26	12	2½

£.	s.	d.
21	12	10½
31	11	11½
57	12	10¼
19	12	4
31	12	5¼
25	11	2¼
25	12	5
29	11	2

£.	s.	d.
13	12	10
71	10	7
19	4	5½
12	3	1
25	2	6
25	12	2
25	11	7½
29	15	5

£.	s.	d.
55	12	6¾
31	18	2½
47	12	5
14	12	9
16	14	5
19	12	2
16	14	5
17	18	5

£.	s.	d.
21	11	10¼
25	12	6
26	10	10
29	15	5
52	10	2
95	12	5
52	15	7
24	17	6

£.	s.	d.
57	12	5
56	19	11½
25	15	10¼
59	12	9
25	19	5
59	10	7
66	18	8
56	16	5

£.	s.	d.
58	12	3½
45	15	2
59	12	10¾
95	15	9
25	12	5
97	16	7
78	10	6½
52	5	9

A Mercer's Bill.

Bought of George Baily, May 17, 1772.

		s.	*d.*		£.	*s.*	*d.*
9 Yards of Silk ——	at	14	6	*per yd.*	6	10	6
12 Yards of flower'd Silk	at	16	8		10	0	0
16 Yards of Sarſenet —	at	6	9		5	8	0
10 Yards of Sattin —	at	9	6		4	15	0
15 Yards of Brocade —	at	2	0		1	10	0
11 Scarves — —	at	2	0	*each*	1	2	0
14 Yards of Genoa Velvet	at	17	4	*per yd.*	12	2	8
10 Yards of Lutſtring —	at	5	2		2	11	8
				Sum			

A Woollen Draper's Bill.

Bought of Thomas Simmons, June 19, 1772.

		s.	*d.*		£.	*s.*	*d.*
16 Yards of Drugget —	at	7	0	*per yd.*	5	12	0
12 Yards of Broad Cloth	at	15	0		9	0	0
9 Yards of Black Cloth	at	16	5		7	7	9
10 Yards of Shalloon —	at	1	8		0	16	8
15 Yards of Serge —	at	1	10		1	7	6
7 Yards of fine Spaniſh Black	at	18	0		6	6	0
16 Yards of Freeze —	at	4	6		3	12	0
12 Yards of ſuperfine Scarlet	at	18	0		10	16	0
				Sum			

A Linen Draper's Bill.

Bought of John Clay, July 17, 1772.

		s.	*d.*		£.	*s.*	*d.*
26 Ells of Dowlas —	at	1	4	*per Ell*	1	14	8
18 Ells of Holland —	at	4	0		3	12	0
12 Ells of Diaper —	at	1	0		0	12	0
12 Damaſk Napkins —	at	2	0	*each*	1	4	0
20 Yards of printed Linen	at	2	0	*per Yd.*	2	0	0
10 Yards of Cambric —	at	12	0		6	0	0
10 Yards of Muſlin —	at	7	0		3	10	0
14 Yards of Canvas —	at	3	4		2	6	8
				Sum			

A Grocer's Bill.

Bought of Thomas Hartley, May 19, 1772.

		s.	d.		£.	s.	d.
8 *lb.* of Raiſins of the Sun	at	0	5	*per lb.*	0	3	4
15 *lb.* of Malaga Raiſins	at	0	4½		0	5	7½
10 *lb.* of Currants —	at	0	6½		0	5	5
11 *lb.* of Sugar — —	at	0	4½		0	4	1½
2 Sugar Loaves, *wt.* 15 *lb.*	at	0	9		0	11	3
13 *lb.* of Rice — —	at	0	3		0	3	3
5 *lb.* of Black Pepper —	at	1	6		0	7	6
10 *oz.* of Cloves —	at	0	10	*per oz.*	0	8	4
				Sum			

A Cheeſemonger's Bill.

Bought of Daniel Bridge, July 17, 1772.

			s.	d.		£.	s.	d.
3 Glouceſterſhire Cheeſes,	*wt.* 24 *lb.*	at	0	4	*per lb.*	0	8	0
3 Warwickſhire	*wt.* 20 *lb.*	at	0	3		0	5	0
1 Cheſhire —	*wt.* 28 *lb.*	at	0	4		0	9	4
½ Firkin of Butter	*wt.* 28 *lb.*	at	0	6		0	14	0
1 Flitch of Bacon	*wt.* 6 *Sto.*	at	4	0	*per Sto.*	1	4	0
7 *lb.* of Cambridge Butter		at	0	6	*per lb.*	0	3	6
9 *lb.* of new Cheeſe ——		at	0	4		0	3	0
7 *lb.* of Cream Cheeſe —		at	0	6		0	3	6
					Sum			

A Milliner's Bill.

Bought of Jane Inman, Auguſt 28, 1772.

		s.	d.		£.	s.	d.
15 Yards of Silver Ribbon	at	2	3	*per yd.*	1	13	9
3 Pair of fine Kid Gloves	at	2	0	*per Pair*	0	6	0
6 Dozen of Iriſh Lamb ditto	at	1	0	——	3	12	0
6 Sarſenet Hoods —	at	4	6	*each*	1	7	0
15 Fans, India Mounts —	at	4	0	——	3	0	0
3 Sets of Knots —	at	2	0	*per Set*	0	6	0
16 Yards of fine Lace —	at	10	0	*per Yd.*	8	0	0
20 Pieces of Bobbin —	at	0	6	*per Piece*	0	10	0
				Sum			

A Carpenter's Bill.

Mr. John Law, Dr. to John Brooks for Carpenter's Work and Materials, *viz.*

1770			s.	d.		£.	s.	d.
May 3	For 30 Feet of Firr Timber,	at	0	3	*per Foot*	0	7	6
5	— 18 whole Deals —	at	1	6	*each*	1	7	0
	— 16 ſlit Deals —	at	1	0	——	0	16	0
	— 4 Hundred of ſix-penny Nails —					0	2	0
	— 3 Hundred of ten-penny Nails					0	2	6
	— 6 Hundred of Brads ——					0	1	6
21	— 18 Days Work	at	3	0	*per Day*	2	14	0
					Sum			

A Baker's Bill.

Mr. Thomas Marriott, Dr. to James Burnet, *viz.*

1770		£.	s.	d.
Feb. 4	For a Peck of Bran — —	0	0	3
	— a fine Peck Loaf — —	0	1	8
13	— a Peck of fine Flour — —	0	1	8
17	— a Buſhel of Pollard — —	0	1	0
18	— ſmall Bread — — —	0	0	2
	— Yeſt — — —	0	0	1
	— a half Peck ſecond Loaf —	0	0	9
20	— a quartern ſecond Loaf ——	0	0	4
	Sum			

A Bill of Diſburſement.

1770		£.	s.	d.
Feb. 17	Laid out in Lamb, ſeven groats —			
18	— Sallad, five Farthings — —			
21	— in Beef, nineteen Pence Halfpenny			
Mar. 7	— in Parſnips, three Halfpence —			
8	— in Potatoes, a Groat —			
9	— in Candle, ſeven Groats and Threepence — —			
10	— in Butter and Cheeſe, eight and twenty Pence — —			
12	— in Bread, three and twenty Pence			
	Sum			

Suppoſe I am indebted,	£.	s.	d.
To A, twenty Pounds ſeven Shillings and four Pence Farthing —			
— B, nineteen Pounds, thirteen Shillings and ten Pence Halfpenny —			
— C, twelve Pounds, fourteen Shillings and ſeven Pence three Farthings			
— D, Twenty-ſix Pounds, ſeventeen Shillings and four Pence Farthing —			
— E, twenty-eight Pounds, thirteen Shillings and ſeven Pence Halfpenny			
— F, twenty-one Pounds, fifteen Shillings and five Pence Halfpenny —			
— G, five Pounds, ſix Shillings and ſeven Pence Farthing —			
How much is the Debt? *Sum*			

2. *Of* TROY-WEIGHT.

Q. *Which are the Denominations of Troy-Weight?*

A. 24 Grains, or *gr.* make 1 Pennyweight, *dwt.*
20 Pennyweight — 1 Ounce, *oz.*
12 Ounces — 1 Pound, *lb.*

Q. *What ſorts of Things are weighed by this Weight?*

A. Gold, Silver, Jewels, Electuaries, and all Liquors.

Q. *What is the Standard for Gold?*

A. 22 Carrats of fine Gold, and 2 Carrats of Copper being melted together, are eſteemed the true Standard for Gold Coin.

Q. *What is a Carrat?*

A. A Carrat is not any certain Quantity or Weight, but the twenty-fourth Part of any Quantity or Weight.

Q. *What is the Standard for Silver?*

A. 11 *oz.* 2 *dwts.* of fine Silver, and 18 *dwts.* of Copper being melted together, are eſteemed the true Standard for Silver Coin; called *Silver Sterling.*

Note, *The Ounce of Silver being valued at five Shillings, one Pennyweight will be valued at three Pence, and the Grain at Half a Farthing.*

EXAMPLES.

oz.	*dwt*	*gr.*	*oz.*	*dwt.*	*gr.*	*lb.*	*oz.*	*dwt.*	*gr.*	*lb*	*oz.*	*dwt*	*gr.*
7	10	12	7	13	12	4	10	12	13	7	10	12	10
6	12	13	6	12	14	3	10	16	13	3	4	16	13
5	16	12	9	12	17	4	4	16	19	3	7	12	12
4	17	10	4	16	13	3	3	13	17	3	3	10	16
4	12	18	7	12	14	4	2	16	14	3	10	16	13
7	12	18	6	19	12	3	3	16	12	4	3	16	12
9	16	19	3	17	16	7	10	16	10	3	3	13	13
8	14	16	3	19	14	6	4	13	15	3	7	18	19
4	16	10	5	9	8	5	10	14	13	9	8	19	9
9	4	8	6	12	13	9	10	9	8	7	5	7	6

3. *Of* AVOIRDUPOIS-WEIGHT.

Q. *Which are the Denominations of Avoirdupois Weight?*

A. 16 Drams, or *dr.* make 1 Ounce, *oz.*
16 Ounces — 1 Pound, *lb.*
28 Pounds — 1 Quarter of an hund. weight, *qr.*
4 Quarters — 1 Hundred weight, or 112*lb.* *C.*
20 Hundred weight 1 Ton, *T.*

Q. *What is the Uſe of Avoirdupois-weight?*

A. Avoirdupois-weight is uſed in weighing any thing of a coarſe and droſſy Nature, as all Grocery and Chandlers Wares, and all Metals but Silver and Gold.

Note, *Bread formerly was weighed by Troy-weight, but is now at Londen weighed by this Weight.*

Q. *What is the difference between a Pound Avoirdupois and a Pound Troy?*

A. The Pound Avoirdupois is equal to 14 *oz.* 11 *dwt.* 15 *gr.* and an half Troy; and the Pound Troy is equal to 13 *oz.* 2 *dr.* and an half, and $\frac{9322}{13999}$ Avoirdupois.

Q. *What other Denominations are there in this Weight?*

A. There are ſeveral other Denominations in Avoirdupois-weight, in ſome particular Goods, and others only cuſtomary in ſome particular Places; as appears by the following Table.

TABLE.

TABLE.

	lb.		lb.
A Firkin of Butter is	56	A Burden of Gad Steel, or 9 Score	180
—— of Soap is	64		
A Barrel of Pot Aſh is	200	A Quintal of Fiſh in Newfoundland is	100
—— Anchovies is	30		
—— Candles is	120	A Stone of Glaſs is	5
—— Figs, from to 2 *C.* 3 *qrs.*	98	A Seam of Glaſs is 24 Stone, or	120
—— Soap is	256	*For Cheeſe and Butter.*	
—— Butter is	224	A Clove or half Stone is	8
—— Gunpowder is	112	A Wey in Suffolk is 32 Cloves, or	256
—— Raiſins is	112		
A double Barrel of Anchovies is	60	—— Eſſex is 42 Cloves or	336
		For Wool.	
A Puncheon of Prunes is 10 *C.* or 12 *C.*		A Clove is	7
		A Stone is	14
A Fother of Lead is 19 *C.* 2 *qrs.*		A Tod is	28
A Stone of Iron or Shot is	14	A Wey is 6 Tod and 1 Stone, or	182
—— Butchers Meat is	8		
A Gallon of Train Oil is	7½	A Sack is 2 Weys, or	364
A Faggot of Steel	120	A Laſt is 12 Sacks, or	4368

EXAMPLES.

T.	*C.*	*qr.*	*lb.*	*C.*	*qr.*	*lb.*	*lb.*	*oz.*	*dr.*	*lb.*	*oz.*	*dr.*
7	12	2	16	25	2	12	23	12	12	23	12	1
3	12	3	12	26	3	13	25	12	10	19	13	1
4	4	2	17	14	2	12	24	10	12	25	12	1
6	3	1	12	16	3	19	20	12	13	20	10	1
5	10	2	13	23	2	10	25	10	10	23	12	1
8	2	3	22	22	3	20	22	13	14	22	10	
4	4	2	20	20	1	15	15	12	12	20	12	
6	3	2	25	10	2	10	20	12	10	26	15	2

4. *Of* APOTHECARIES-WEIGHT.

Q. *Which are the Denominations of Apothecaries-weight?*

A. 20 Grains, or *gr.* make 1 Scruple, *ſcr.*
3 Scruples — 1 Dram, *dr.*
8 Drams — 1 Ounce, *oz.*
12 Ounces — 1 Pound, *lb.*

Q. *What is the Uſe of Apothecaries-weight?*

A. Apothecaries-weight is ſuch as their Medicines are compounded by.

Note 1. *The Apothecaries mix their Medicines by this Rule, yet buy and ſell their Commodities by Avoirdupois-weight.*

2. *The Apothecaries Pound and Ounce and the Pound and Ounce Troy, are the ſame, only differently divided and ſubdivided.*

EXAMPLES.

lb.	*oz.*	*dr.*	*ſcr.*	*gr.*	*lb.*	*oz.*	*dr.*	*ſcr.*	*gr.*	*lb.*	*oz.*	*dr.*	*ſcr.*	*gr.*
3	10	7	2	19	7	2	3	2	15	7	3	2	2	13
5	3	4	1	13	5	2	2	1	13	6	2	7	1	14
6	5	7	2	12	8	5	5	2	15	7	5	2	2	15
4	3	6	2	14	7	6	4	0	10	5	4	5	2	13
3	4	5	0	10	5	5	3	2	12	6	3	3	1	15
6	7	3	2	12	8	3	6	1	10	8	5	6	2	12
7	3	4	0	10	6	3	5	2	13	7	8	4	1	10
6	10	3	2	15	8	5	4	1	14	8	5	6	2	13

5. *Of* LONG MEASURE.

Q. *Which are the Denominations of Long Meaſure?*

A. 3 Barley-Corns, or *B. c.* make 1 Inch, *In.*
4 Inches — — 1 Hand, *hd.*
12 Inches — — 1 Foot, *Ft.*
3 Feet — — 1 Yard, *yd.*
6 Feet — — 1 Fathom, *Fa.*
5 Yards and a Half — 1 Rood, Pole, or Perch
40 Poles — — 1 Furlong, *Fu.*
8 Furlongs — 1 Mile, *M.*
3 Miles — — 1 League, *L.*
60 Miles — — 1 Degree, *Deg.*

Note, *A Degree is* 69 *Miles and* 4 *Furlongs very near, tho' commonly reckoned but* 60 *Miles.*

Q. *What is the Uſe of Long Meaſure?*

A. To meaſure Diſtances, or Places, or any thing elſe, where Length is conſidered, without regard to the Breadth.

Q. *Is the Pole or Perch always of the ſame Length?* *A.* No.

Q. *What is the Difference?*

A. Five Yards and an Half are the Statute-Meaſure for a Pole or Perch, but for Fens and Wood-lands, it is cuſtomary to reckon 18 Feet to the Pole; and for Foreſts 21 Feet.

Q. *What is the Uſe of an Hand?*
A. It is uſed to meaſure Horſes.
Q. *What is the Uſe of a Fathom?*
A. It is uſed to meaſure Depths.

EXAMPLES.

M.	*f.*	*p.*	*Yds.*	*f.*	*in.*	*Le.*	*m.*	*f.*	*p.*	*Yds.*	*f.*	*in.*	*b.c.*
25	5	20	25	2	7	32	2	6	23	23	2	0	0
23	3	30	30	0	8	43	2	2	16	32	2	10	2
25	0	10	32	0	6	30	1	3	10	20	1	3	2
20	3	15	25	2	5	20	2	5	10	26	2	10	1
34	2	20	26	1	5	24	1	3	20	29	1	7	2
34	5	23	32	2	4	30	2	4	30	32	2	3	2
25	3	20	43	1	5	20	1	3	20	30	1	6	1
40	3	10	20	2	9	10	0	2	13	23	2	6	0

6. *Of* CLOTH-MEASURE.

Q. *Which are the Denominations of Cloth-Meaſure?*

A. 2 Inches, or *in.* and a Quarter make	— — —	1 Nail, *N.*
4 Nails	— — —	1 Qr. of a Yard, *qr.*
4 Quarters	— —	1 Yard, *yd.*
3 Quarters of a Yard	—	1 Flemiſh Ell, *F.E.*
5 Quarters of a Yard	—	1 Engliſh Ell, *E.*

Note 1. *The Yard is uſed in meaſuring all ſorts of Woollen Cloths, wrought Silks, moſt Linens, Tape and Gartering.*

2. *The Ell Engliſh is uſed in meaſuring ſome particular Linens, called Hollands.*

3. *The Ell Flemiſh is uſed in meaſuring Tapeſtry.*

EXAMPLES.

Yds.	*qrs.*	*na.*	*Ells.*	*qrs.*	*na.*	*Yds.*	*qrs.*	*na.*	*E.F.*	*qrs.*	*na.*
17	1	1	14	1	2	17	2	1	17	1	2
11	3	1	17	3	1	16	3	3	17	1	3
16	1	2	14	4	1	17	1	2	14	1	2
19	3	1	16	3	2	19	2	1	16	2	0
17	1	2	19	1	1	17	3	2	14	0	0
12	3	3	17	2	3	16	1	3	19	2	1
19	1	1	16	3	1	19	2	1	17	2	3
14	2	3	15	1	2	27	1	2	16	1	2

7. *Of*

7. *Of* LAND-MEASURE.

Q. *Which are the Denominations of Land-Meaſure?*

A.

9 Square Feet, or *Ft.* —	make	1 Yard, *Y.*
30 Yards and a Quarter —		1 Pole, *Po.*
40 Poles in Length and 1 in Breadth		1 Rood, *R.*
4 Roods — — —		1 Acre, *A.*

Q. *What is the Uſe of Land-Meaſure?*

A. It gives the Content of any Piece of Ground in Acres.

EXAMPLES.

A.	*r.*	*p.*	*A.*	*r.*	*p.*	*A.*	*r.*	*p.*
17	3	12	17	1	12	26	1	36
11	2	19	11	2	12	13	2	22
15	1	21	19	3	27	23	3	23
16	1	12	19	1	16	36	2	28
17	2	13	20	3	14	22	2	33
13	2	12	16	1	12	19	0	19
12	1	17	23	3	14	33	3	16
23	3	20	20	2	20	40	2	24

8. *Of* LIQUID-MEASURE.

Q. *How many ſorts of Liquid-Meaſure are there?*

A. Two: Wine-Meaſure and Wincheſter-Meaſure.

Q. *What is meant by Wincheſter-Meaſure?*

A. It is a particular Meaſure uſed for Beer and Ale.

Q. *What is the Difference between Wine-Meaſure and Wincheſter-Meaſure?*

A. A Gallon of Wine is 231 ſolid Inches, but a Gallon of Beer or Ale exceeds that Meaſure by 51 Inches, and is 282 ſolid Inches.

(1.) *Of* WINE-MEASURE.

Q. *Which are the Denominations of Wine-Meaſure?*

A.

2 Pints, or *pts.*	make	1 Quart, *qt.*
4 Quarts	—	1 Gallon, *gal.*
10 Gallons	—	1 Anchor of Brandy or Rum, *An.*
18 Gallons	—	1 Runlet, *R.*
31½ Gallons	—	1 Barrel, *Bar.*
42 Gallons	—	1 Tierce, *Tier.*
63 Gallons	—	1 Hogſhead, *hhd.*
84 Gallons	—	1 Puncheon, *Pu.*
2 Hogſheads		1 Pipe or Butt, *P.*
2 Pipes or 4 Hhds.		1 Tun, *T.*

Q. *What other Liquors are meaſured by the Wine Standard?*
A. All Brandies, Spirits, Strong waters, Perry, Cyder, Mead, Vinegar, Honey and Oil.

Note, *Milk is alſo retailed by this Standard, not by Law, but Cuſtom only.*

EXAMPLES.

T.	*hhds.*	*gals.*	*qts.*	*Hhds.*	*gals.*	*qts.*	*Tier.*	*gals.*	*qts.*
7	1	12	2	27	10	2	27	12	1
6	3	31	3	22	13	3	29	17	3
7	1	41	2	26	11	3	22	11	2
6	2	17	1	29	12	2	27	31	3
7	3	14	3	23	22	0	29	12	1
1	2	19	1	27	32	2	27	11	2
9	2	15	2	29	27	3	26	17	1
3	1	11	2	26	33	2	22	11	3

(2.) *Of* WINCHESTER-MEASURE.

Q. *Which are the Denominations of Wincheſter-Meaſure?*

A. 2 Pints, or *pts.* make 1 Quart, *qt.*
4 Quarts — 1 Gallon, *gal.*
8 Gallons — 1 Firkin of Ale, *Fir.*
9 Gallons — 1 Firkin of Beer, *Fir.*
2 Firkins — 1 Kilderkin, *Kil.*
4 Firkins — 1 Barrel, *Bar.*
1 Barrel and a half, or 54 Gallons 1 Hogſhead of Beer, *hhd.*

Q. *What is the Difference between Ale and Beer Meaſure?*
A. In London only they compute 8 Gallons to the Firkin of Ale, and 32 Gallons to the Barrel; but in all other parts of England, for Ale, Strong Beer and Small Beer, 34 Gallons are computed to the Barrel, and 8 Gallons and an Half to the Firkin.

Q. *What other Commodities are there that go by the Wincheſter-Meaſure?*

A. A Barrel of Salmon or Eels is 42 Gallons
A Barrel of Herrings 32 Gallons
A Keg of Sturgeon 4 or 5 Gallons
A Firkin of Soap — 8 Gallons

EXAMPLES.

Hhds.	*gals.*	*qts.*	*B.B.*	*fir.*	*gal.*	*Hhds.*	*gals.*	*qts.*	*A.B.*	*fir.*	*gal.*
7	12	1	23	3	3	26	17	1	23	1	7
6	27	2	27	2	6	13	19	2	24	2	6
3	21	2	29	3	7	21	16	3	27	3	4
2	11	1	27	2	8	31	18	2	27	1	5
3	17	2	26	1	5	27	10	1	26	3	2
2	12	1	37	1	4	31	18	2	27	1	3
6	17	3	27	1	3	26	31	1	26	2	1
7	31	2	23	2	2	31	26	2	29	2	0

9. *Of* DRY MEASURE.

Q. *Which are the uſual Denominations of Dry Meaſure?*

A. 2 Pints, or *pts.* make — 1 Quart, *qt.*
2 Quarts — 1 Pottle, *Pot.*
2 Pottles — 1 Gallon, *gal.*
2 Gallons — 1 Peck, *P.*
4 Pecks — 1 Buſhel, *Buſh.*
8 Buſhels — 1 Quarter of Corn, *qr.*
36 Buſhels — 1 Chaldron of Coals, *Ch.*

Q. *Wherein does London differ from other Places in England in Coal Meaſure?*

A. In London 36 Buſhels make a Chaldron: but in all other Places 32 Buſhels make a Chaldron: The Buſhel alſo in Water-Meaſure contains 5 Pecks.

Q. *What other Denominations are there in Dry Meaſure?*

A. A Score of Coals — 21 Chaldrons
A Sack of Coals — 3 Buſhels
A Sack of Corn — 4 Buſhels
10 Quarters of Corn make 1 Wey
12 Weys — — 1 Laſt
A Load of Corn — is 5 Buſhels
A Cart load ditto — 40 Buſhels

Q. *What is the Uſe of Dry Meaſure?*

A. Dry Meaſure is applied to all dry Goods, as Corn, Seeds, Fruit, Roots, Sand, Salt, Sea Coal, Charcoal, Small-coal, Oyſters, Muſſels and Cockles.

Q. *What is the Standard for Dry Meaſure?*

A. The Standard for Dry Meaſure is a Wincheſter Buſhel, being 18 inches and a half wide throughout, and 8 inches deep. One Gallon of this quantity is 286 ſolid Inches and $\frac{4}{5}$, and conſequently is leſs than an Ale Gallon by 13 ſolid Inches and $\frac{1}{5}$.

EX.

EXAMPLES.

Ch.	*bu.*	*p.*	*Qrs.*	*bu.*	*p.*	*Ch.*	*bu.*	*p.*	*Qrs.*	*bu.*	*p.*
17	11	2	14	7	2	27	10	1	36	7	3
16	10	2	16	1	1	17	12	3	43	6	2
19	11	1	19	3	2	24	21	1	22	3	3
17	12	3	16	1	1	31	32	2	37	3	2
16	19	3	17	3	2	71	19	1	26	5	2
17	11	1	16	1	1	16	12	2	28	4	3
19	11	3	12	3	1	17	31	3	33	7	0
11	14	1	37	2	3	16	14	4	42	3	2

10. *Of* TIME.

Q. *Which are the Denominations of Time?*

A. 60 Seconds, or *Sec.* make 1 Minute, *Min.*
60 Minutes — 1 Hour, *Hr.*
24 Hours — 1 Day, *Da.*
7 Days — 1 Week, *Wk.*
4 Weeks — 1 Month, *Mo.*
13 Months, 1 Day and 6 Hours, 1 common or Julian Year, *Yr*

Q. *What is a Solar Year?*

A. According to the beſt Computations, a Solar Year is 365 Days, 5 Hours, 48 Minutes, and 55 Seconds.

Q. *How is the Year divided by the Calender?*

A. No more Days than 30 hath the Month of September;
The ſame may be ſaid of June, April, November;
The reſt of the Months are juſt 30 and one,
Except that ſhort Month February alone,
Which to itſelf claimeth 8 and a Score,
But in ev'ry Leap-Year, we give it one more.

EXAMPLES.

M.	*w.*	*d.*	*H.*	*m*	*ſec.*	*M.*	*w.*	*d.*	*D.*	*h.*	*m.*	*ſec.*
14	1	6	17	10	32	31	2	1	17	11	13	16
17	2	5	16	22	21	17	1	6	19	12	16	11
16	1	3	14	21	32	17	3	4	17	12	17	13
19	3	2	4	2	3	16	1	1	14	13	26	31
16	1	1	7	3	1	17	2	1	13	12	11	48
26	2	0	73	16	30	16	2	5	17	19	19	12
13	2	2	22	28	42	19	1	4	13	23	26	51

11. *Of* MOTION.

Q. *Which are the Denominations of Motion in the heavenly Bodies?*

A. 60 Seconds, or ″ make 1 prime Minute, ′.
60 Minutes — 1 Degree, °.
30 Degrees — 1 Sign.
12 Signs, or 360 Degrees, make the whole great Circle of the Zodiac.

EXAMPLES.

°.	′.	″.	°.	′.	″.	°.	′.	″.
71	10	16	47	17	19	46	17	31
12	11	19	17	19	38	17	36	18
17	16	13	12	11	41	13	11	12
19	11	26	13	10	16	16	19	12
17	48	51	16	27	12	17	12	10
14	12	11	73	19	12	16	12	10
17	16	11	16	41	32	17	19	17
57	16	17	21	32	41	31	26	43

12. *Of Things bought and ſold by the Tale.*

Q. *Which are the Denominations of Things accounted by the Tale?*

A. 12 Particulars make 1 Dozen
12 Dozen — 1 Groſs
12 Groſs or 144 Dozen 1 great Groſs

Examples are needleſs.

Queſtions to exerciſe Addition.

1. A Man was born in the Year 1702, I demand when he will be 57 Years of Age?

2. There are two Numbers whoſe Difference is 17, and the leſſer Number is 44: what is the greater Number?

3. A Man borrowed a Sum of Money, and paid in Part 12 *l.* 10 *s.* and the Remainder is 17 *l.* 10 *s.* I demand the Sum borrowed?

4. A owes me three Guineas, B 50 *l.* 12 *s.* C 104 *l.* D threeſcore and ſeventeen Pounds; How much is due to me in all?

3. A, B and C, bought a Parcel of Goods, in the Purchaſe of which A laid out 3 *l.* B 40 *s.* and C 20 *d.* How much was laid out in all?

6. A Man

6. A Man hath 6 Bags of Hops; the firſt weighs 2 *qrs.* 14 *lb.* and each of the reſt weighs 14 *lb.* more: What Quantity hath he in the Whole?

7. A Man took an Houſe for 12 Years; and by Agreement was to pay 100 *l.* 10 *s.* down; 190 *l.* 4 *s.* at the end of 6 Years; and 109 *l.* 6 *s.* at the End of 12 Years. I demand the whole Sum?

8. A Shopkeeper having opened a Shop, the firſt Week ſold Goods to the Valve of threeſcore Pounds, the next Week he took fourſcore Pounds, but the third Week he took no more than thirty Shillings: How much did he receive in all?

Of SUBTRACTION.

Q. W*HAT is the Uſe of Subtraction?*

A. By taking a leſs Number from a greater, it ſhews the Difference between both.

Q. *How many Sorts of Subtraction are there?*

A. Two: Simple and Compound.

Of Simple SUBTRACTION.

Q. *What is Simple Subtraction?*

A. Simple or Single Subtraction is the finding a Difference between any two Numbers, whoſe Signification is the ſame, as the Difference between 6 Yards and 4 Yards, is 2 Yards.

Q. *How are Numbers to be placed in Subtraction?*

A. With Units under Units, Tens under Tens, *&c.* as in Addition.

Q. *What Rule have you for the Operation of Subtraction in general?*

A. When the lower Number is greater than the upper, take the lower Number from the Number which you borrow, and to that Difference add the upper Number, carrying one to the next lower Place.

Q. *What Number muſt you borrow, when the lower Number is greater?*

A. The ſame which you ſtop at in Addition.

Q. *How do you prove Subtraction?*

A. By adding the Remainder and the leſſer Line together, which will always be equal to the greater Line. Or,

By ſubtracting the Remainder from the greater Line, and the Difference will always be equal to the leſſer Line.

EX-

EXAMPLES.

	£.	*Yards.*	*Miles.*	*Days*	*Months.*
From	763	7694	41372	761214	7613471
Take	122	1867	13976	121812	2813126
Diff.					

	Hours.	*lb.*	*Crowns.*	*Shillings.*
From	31261812	312617127	71161871	76126441
Take	19879428	173121712	26571014	5910917
Diff.				

Of Compound SUBTRACTION.

Q. *What is Compound Subtraction?*

A. Compound Subtraction produces a Difference between any two Sums of divers Denominations.

1. *Of* MONEY.

EXAMPLES.

	£.	*s.*	*d.*	*£.*	*s.*	*d.*	*£.*	*s.*	*d.*	*£.*	*s.*	*d.*
From	14	10	6½	36	12	6½	76	12	6¾	31	18	4½
Take	3	17	8½	17	12	2¼	17	13	3¼	16	19	1
Diff.				19	0	4						

	£.	*s.*	*d.*	*£.*	*s.*	*d.*	*£.*	*s.*	*d.*	*£.*	*s.*	*d.*
Borr.	41	15	3	76	3	4½	73	7	6	17	12	1½
Paid	14	17	1½	13	17	7	19	4	1½	14	7	2

	£.	*s.*	*d.*	*£.*	*s.*	*d.*	*£.*	*s.*	*d.*	*£.*	*s.*	*d.*
Lent	36	11	6¼	47	17	6	413	11	7¾	71	18	9
Rec.	7	12	7¾	29	11	6½	171	18	9½	17	16	10¾
Due												

	£.	s.	d.		£.	s.	d.
Borrowed	764	0	0	*Lent*	800	10	6
Paid at ſeveral Times	13	1	1½	*Received at ſeveral Times*	12	11	2¼
	17	4	2		19	12	6
	16	1	6¾		17	11	2¼
	21	2	1		14	11	3
	19	11	10		19	12	2
	26	13	5¼		14	11	8¾
	11	19	6½		17	16	2¼
	13	12	2½		46	12	7¾
Paid in all				*Received in all*			
Unpaid				*Remains due*			

2. TROY-WEIGHT.

	Oz.	dwt.	gr.	Oz.	dwt.	gr.	Oz.	dwt.	gr.	lb.	oz.	dwt.	gr.
From	71	11	12	71	12	18	13	16	12	84	10	11	12
Take	2	10	19	10	4	19	5	19	14	17	4	11	7
Diff.													

3. AVOIRDUPOIS-WEIGHT.

	C.	qrs.	lb.	lb.	oz.	dr.	lb.	oz.	dr.	T.	C.	qrs.	lb.
Bou.	72	1	18	17	2	1	17	10	1	12	1	2	10
Sold	3	1	26	10	13	2	15	14	3	5	3	1	19
Unſold													

4. APOTHECARIES-WEIHGT.

	oz.	dr.	ſcr.	gr.	oz.	dr.	ſcr.	gr.	lb.	oz.	dr.	ſcr.	gr.
From	65	4	2	10	47	5	1	16	48	2	2	0	19
Take	7	7	2	12	2	1	2	18	10	1	2	2	17
Diff.													

5. LONG-MEASURE.

	Le.	*m.*	*f.*	*p.*	*Yds.*	*f.*	*in.*	*b.c.*	*Le.*	*m.*	*f.*	*p.*
From	71	1	3	10	48	0	1	2	61	0	1	3
Take	14	2	5	16	12	0	3	1	17	1	2	20
Diff.												

6. CLOTH-MEASURE.

	Yds.	*qr.*	*na.*	*E.F.*	*qr.*	*na.*
Bou.	71	3	1	51	2	2
Sold	14	2	3	16	1	3
Unſold						

	Yds.	*qr.*	*na.*	*E.F.*	*qr.*	*na.*
From	47	2	1	17	2	2
Take	12	1	3	14	4	3
Diff.						

	Yds.	*qr.*	*na.*
A Draper bought	148	0	0
Sold at ſeveral Times	14	1	2
	17	3	3
	19	1	2
	16	2	1
	17	3	3
Sold in all			
Unſold			

7. LAND-MEASURE.

	A.	*r.*	*p.*	*A.*	*r.*	*p.*	*A.*	*r.*	*p.*	*A.*	*r.*	*p.*
Bought	12	1	10	17	3	17	28	1	7	32	0	9
Tilled	5	3	17	12	3	23	19	1	28	16	2	23
Untilled												

8. WINE-MEASURE.

	T.	*hds*	*gals.*	*T.*	*hds*	*gal.*	*Gals.*	*qts.*	*pts.*	*Gals.*	*qts.*	*pts.*
From	3	2	10	7	2	10	19	2	1	67	1	1
Take	1	3	19	1	2	28	12	1	1	12	3	0
Diff.												

9. WINCHESTER-MEASURE.

	Hds.	*gals.*	*qts.*	*A.B.*	*f.*	*gals.*	*B.B.*	*f.*	*gals.*	*Hds.*	*gals.*	*qts.*
Bou.	17	10	1	17	2	1	48	1	3	41	2	3
Sold	12	11	2	14	1	3	17	1	7	23	3	3
Unſold												

10. DRY-MEASURE.

	Ch.	*bu.*	*p.*	*Ch.*	*bu.*	*p.*	*Qrs.*	*bu.*	*p.*	*Qrs.*	*bu.*	*p.*
From	17	2	1	40	1	2	19	1	1	26	1	3
Take	10	1	3	16	5	1	12	7	2	19	1	2
Diff.												

11. TIME.

	D.	*h.*	*m.*	*ſec.*	*W.*	*d.*	*h.*	*m.*	*ſec.*	*W.*	*d.*	*h.*	*m.*	*ſec.*
From	41	13	22	12	14	1	10	12	10	17	1	10	12	10
Take	22	16	33	31	10	3	19	48	26	10	2	14	6	15
Diff.														

12. MOTION.

	°.	′.	″.	°.	′.	″.	°.	′.	″.
From	48	10	12	47	2	10	62	13	9
Take	19	11	16	12	19	46	49	18	33
Diff.									

Queſtions to exerciſe SUBTRACTION.

1. A Man was born in the Year 1702, I demand his Age in the Year 1761?

2. There are two Numbers, the greater Number is 61, and the leſſer Number is 44; I demand the Difference?

3. There are two Numbers, whoſe difference is 17, and the greater Number is 61: I demand the leſſer Number?

4. The Brewer and the Baker drew Bills each upon the other, the Brewer ſtands indebted 45*l.* 19*s.* and the Baker 26*l.* and 7*d.*½; who is the proper Perſon indebted, and how much?

5. A Man borrowed 30*l.* and paid in Part 12*l.* 10*s.* I demand how much remains unpaid?

6. King Charles the Martyr, was beheaded in the Year 1648; how many years is it ſince?

7. A is indebted to the Brewer the Sum of 109*l.* 10*s.* B owes him 94*l.* 4*s.* 10*d.*½ how much does one owe more than the other?

8. What Sum is that, which taken from 100*l.* leaves 48*l.* 7*s.* 6*d*½?

9. There were 4 Bags of Money, containing as follows, *viz.* The firſt Bag, 34*l.* the ſecond Bag 50*l.* the third Bag 100*l.* and the fourth Bag 150*l.* which were to be paid to ſeveral Perſons; but one of the Bags being loſt, there were but 234*l.* paid; I demand which Bag was wanting?

Of MULTIPLICATION.

W*HAT is Multiplication?*

A. It is a ſhort Way of performing ſeveral Additions.

Q. *How many Parts are there in Multiplication?*

A. Three, *viz.*

1. The *Multiplicand*, or Sum to be multiplied.
2. The *Multiplier*, or Sum multiplied by.
3. The *Product*, or Total of the Multiplicand, as often as there are Units in the Multiplier.

Note, *The Multiplicand and the Multiplier, are alſo called* Factors; *and the Product, the* Fact *or* Rectangle.

Q. *How many ſorts of Multiplication are there?*

A. Two, *viz.* Simple and Compound.

Of Simple MULTIPLICATION.

Q. *What is Simple Multiplication?*

A. Simple Multiplication is the multiplying of any two Numbers together, without reſpect to their Signification; as 7 times 8 is 56.

Note 1. *As Addition and Subtraction of Integers are called Simple Addition and Simple Subtraction: ſo ſhould Multiplication and Diviſion of Integers be called Simple Multiplication and Simple Diviſion; and that only ſhould be called Compound Multiplication and Compound Diviſion, which hath Numbers of divers Denominations to be either multiplied or divided.*

2. *The following Table muſt be learned perfectly by heart, before you can proceed any further.*

The

The MULTIPLICATION TABLE.

3 times	3 is	9	5 times	6 is	30	11 times	3 is	33
	4	12		7	35		4	44
	5	15		8	40		5	55
	6	18		9	45		6	66
	7	21	6 times	6	36		7	77
	8	24		7	42		8	88
	9	27		8	48		9	99
4 times	4	16		9	54	12 times	3	36
	5	20	7 times	7	49		4	48
	6	24		8	56		5	60
	7	28		9	63		6	72
	8	32	8 times	8	64		7	84
	9	36		9	72		8	96
5 times	5	25	9 times	9	81		9	108

CASE I.

Q. *What do you obſerve in the firſt Caſe of Multiplication?*
A. That the Factors be placed one under another, in ſuch manner that Units may ſtand under Units, Tens under Tens, *&c.* and then multiply as the Table directs.

EXAMPLES.

£.	*Crowns.*	*Days.*	*Hours.*
47613127	47613174	71261812	71261312
2	3	4	5

Minutes.	*Years.*	*Gallons.*	*Ounces.*
73127184	71312674	31261267	47612312
6	7	8	9

Shillings.	*Yards.*	*Buſhels.*	*Ells.*
31261731	76138126	82365243	65423789
11	12	11	12

CASE 2.

Q. *What do you obſerve in the ſecond Caſe of Multiplication?*

A. 1. When the Multiplier conſiſts of more Figures than one, there muſt be made as many ſeveral Products, as there are Figures contained in the Multiplier.

2. Let the firſt Figure of every Product be placed exactly under its Multiplier.

3. Add theſe Products together, and their Sum will be the total Product.

Q. *How do you prove Multiplication?*

A. Multiplication and Diviſion do mutually prove each other; yet Multiplication may as truly be proved by itſelf, by inverting the Factors.

EXAMPLES.

Crowns.	*Days.*	*Weeks.*	*Pence.*
691861	129186	281216	181281
26	98	978	763
17988386	12660228	275029248	138317403

Ounces.	*Yards.*	*Pints.*	*Quarts.*
269181	261986	812617	281691
4629	7638	43859	76286
1246038849	2001049068	35640569003	21489079626

Q. *What Exceptions have you to this Caſe?*

A. 1. When theſe Figures 1 and 1, or 1 and 2, happen together in the Multiplier, you may multiply by both at once as in Caſe 1.

EXAMPLES.

Weeks.	*Buſhels.*	*Grains.*	*Leagues.*
761312	671612	963458	843126
412	114	912	119
313660544	76563768	878673696	100331994

2. When any other Number between 12 and 20 happens, as 13, 14, 15, *&c.* then multiply by the Figures in Units Place, and as you multiply, add to the Product of each ſingle Figure that of the Multiplicand, which ſtands next on the right Hand.

EX-

EXAMPLES.

Gallons.	*Days.*	*Months.*	*lb.*
4721217	4713176	4731261	4713761
15	16	17	18

CASE 3.

Q. *What do you obſerve in the third Caſe of Multiplication?*

A. 1. Such Factors as have Cyphers at the Ends, muſt be ſet one under another, as if there were no Cyphers.

2. The Cyphers placed at the End of either, or both of the Factors, are to be omitted till the laſt Product, and then the ſame Number of Cyphers muſt be annexed to it,

EXAMPLES.

Pence.	*Hours.*	*Years.*
476000	180120	461210
170	48100	81900
80920000	8663772000	37773099000

Nails.	*Inches.*	*Barrels.*
760000	461200	618010
4800	72000	74210
3648000000	33206400000	45862522100

CASE 4.

Q. *What do you obſerve in the fourth Caſe of Multiplication?*

A. When Cyphers are placed between the ſignificant Figures in the Multiplier, they muſt be omitted in the Operation: Regard being had to the firſt Figure of every particular Product as before.

EXAMPLES.

Gallons.	*Eggs.*	*Buttons.*
128121	128128	246145
72001	70043	60012
9224840121	8974469504	14771653740

CASE

CASE 15.

Q. *How do you multiply by the Parts of any Number inſtead of the Whole?*

A. When the Multiplier is ſuch a Number, that any two Figures being multiplied together, will make the ſaid Multiplier, it is ſhorter to multiply the given Number by one of thoſe figures, and that product by the other; as 5 times 7 is 35.

EXAMPLES.

Pounds.	*Men.*	*Soldiers.*	*Sailors.*
764126	764131	461231	461312
35	48	72	36
26744410	36678288	33208632	16607232

Of Compound MULTIPLICATION.

Q. *What is Compound Multiplication?*

A. When ſeveral Numbers of divers Denominations are given to be multiplied by one common Multiplier; this is called Compound Multiplication.

£.	*s.*	*d.*
17	3	1¼
		2

lb.	*oz.*	*dwt.*	*gr.*
17	5	12	16
			3

C.	*qrs.*	*lb.*
43	1	14
		4

lb.	*oz.*	*dr.*
17	12	10
		5

M.	*f.*	*p.*
16	4	21
		6

Yds.	*f.*	*in.*	*b.c.*
17	2	3	1
			7

Yds.	*qrs.*	*na.*
16	3	2
		8

B.B.	*fir.*	*gal.*
17	2	3
		9

Ch.	*b.*	*p.*
16	12	3
		10

M.	*w.*	*d.*
16	3	4
		11

D.	*h.*	*m.*	*ſec.*
17	14	14	15
			12

°.	′.	″.
16	11	13
		7

Note, *If the Learner be taught to turn back to the Bills of Parcels in Addition, he will find plenty of Examples in Compound Multiplication.*

Queſtions

Queſtions to exerciſe MULTIPLICATION.

1. If one Man's Pay be 3*s*. what muſt 40 Men have?

2. What is the Product of 76, multiplied by 3 and by 7?

3. There are 124 Men employed to finiſh a Piece of Work, and they are to have 3 *l*. each Man; I demand how much they muſt all have?

4. An Army of 10000 Men having plundered a City, took ſo much Money, that when it was ſhar'd among them, each Man had 27 *l*. I demand how much Money was taken in all?

5. There were 40 men concern'd in the Payment of a Sum of Money, and each man paid 1271 *l*. how much was paid in all?

6. If one Foot contains 12 Inches, I demand how many Inches there are in 126 Feet?

7. What is the Product of 769 multiplied by 9 and 7?

Of DIVISION.

Q. WHAT *is Diviſion?*

A. It is a ſhort Way of performing ſeveral Subtractions, and ſhews how oft one Number is contained in another, and what remains.

Q. *How many Parts are there in Diviſion?*

A. Four, *viz.*

1. The *Dividend*, or Sum to be divided.
2. The *Diviſor*, or Sum divided by.
3. The *Quotient*, or Anſwer to the Queſtion.
4. The *Remainder*, which is always leſs than the Diviſor, and of the ſame Name with the Dividend.

Note, *The Diviſor, Dividend and Quotient are certain; but the Remainder is uncertain, becauſe ſome Operations in Diviſion have no Remainder.*

Q. *How many ſorts of Diviſion are there?*

A. Two; Simple and Compound.

Of Simple DIVISION.

Q. *What is Simple Diviſion?*

A. Simple Diviſion is, when the Diviſor and Dividend are made choice of without any Regard to their Signification; as 56 divided by 7 gives 8 for the Quotient; or, the Number 7 is contained in 56, eight times.

Q. *How many ſorts of Simple Diviſion are there?*

A. Two; Short Diviſion and Long Diviſion.

Of Short DIVISION.

Q. *What is Short Diviſion?*

A. Short Diviſion is, when the Diviſor does not exceed 12.

EXAMPLES.

Minutes.	*Months.*	*Days.*
2)71313674(	6)312610841(	11)7312613107(
3)42310812(	7)713126719(	12)3812617314(
4)13812612(	8)701267131(	11)1612798131(
5)61231281(	9)126713108(	12)1731261712(

Q. *How is Diviſion proved?*

A. Multiply the Diviſor and Quotient together, and the Remainder (if there be any) add to the Product; that Sum will be equal to the Dividend.

Of Long DIVISION.

CASE 1.

Q. *What is Long Diviſion?*

A. When the Diviſor is more than 12, for help of the memory, we are obliged to multiply the Quotient Figure and Diviſor together, and ſubtract that Product from the Dividend, in order to find out the Remainder; which Operation muſt be continued to every Quotient Figure: And this is called Long Diviſion.

EXAMPLES,

Yards.	*Shillings.*	*Pence.*
91)71265871(	28)71261714(	1217)31917312(
82)31712617(	19)73126171(	3164)12697126(
73)17312618(	381)13261714(	6128)71217312(
64)47312617(	773)31746173(	2912)47161231(
55)73181061(	937)13189714(	33108)91261814(
46)76131714(	761)12816171(	71216)17131716(
37)31231712(	7618)189173l2(	86257)34175362(

CASE 2.

Q. *What do you obſerve of Cyphers placed at the end of the Diviſor?*

A. 1. They muſt be cut off; and the ſame Places alſo muſt be cut off in the Dividend.

2, Thoſe Figures which are cut off in the Dividend, muſt be annexed to the Remainder at laſt.

EXAMPLES.

Yards.	*Crowns.*
625|00)712613|12(	128|000)71126|071(
426|00)713121|74(	412|000)71613|181(

CASE

CASE 3.

Q. *How do you divide by the parts of any Number inſtead of the whole?*

A. When the Diviſor is ſuch a Number that any two Figures being multiplied together, will make the ſaid Diviſor, it is ſhorter to divide the Given Number by one of thoſe Figures, and that Quotient by the other: as 5 times 7 is 35.

EXAMPLES.

Pence.	*Crowns.*	*Pounds.*
35)26744450(	48)36678288(	72)33208652(

Of Compound DIVISION.

Q. *What is Compound Diviſion?*

A. When ſeveral Numbers of divers Denominations are given to be divided by one common Diviſor; this is called Compound Diviſion.

EXAMPLES.

£. s. d.	*lb. oz. dwt.gr.*	*T. C. qr. lb.*
2)48 12 6½(	3)14 10 3 16(	4)17 1 1 14
lb. oz. dr.	*M. f. p.*	*Yds. f. in. b.c.*
5)46 12 0(	6)38 2 14(	7)46 0 10 2(
Yds.qrs.na.	*A.B.fir.gal.*	*Ch. bu. p.*
8)16 2 2(	9)17 3 2(	10)20 13 2(
M. w. d.	*D. h. m. ſec.*	°. ′. ″.
11)48 2 2(	12)46 16 12 30(	12)33 4 11(

Queſtions to exercife DIVISION.

1. If 1400s. be divided amongſt 40 men, how much a piece?

2. If 1596 be divided by 21, what is the Quotient?

3. There are 124 Men who have 372 *l.* among them, how much muſt each Man have?

4 An Army of 19000 Men having plundered a City, took 266000*l.* how much muſt each man have?

5. There was a certain Number of Men concern'd in the Payment of 1272 *l.* and each man paid 3 *l.* I demand the Number of Men?

6. What is the Quotient of 48447, divided by 9 and by 7?

7. If 3264 be divided by 12 and 4, what is the Quotient?

8. A certain Man intending to go a journey of about 3264 Miles, would compleat the ſame in 136 Days; I demand how many Miles he muſt travel each Day?

Of REDUCTION.

Q. WHAT *is Reduction?*

A. Reduction is the bringing or reducing Numbers of one Denomination into other Numbers of another Denomination, but of the ſame Value.

Q. *How are Denominations of any kind reduc'd from one to another?*

A. By Multiplication and Diviſion.

Q. *When is Multiplication to be uſed?*

A. When great Names are to be brought into ſmall; as Pounds into Shillings, or Days into Hours; and this is called Reduction Deſcending.

Q. *When is Diviſion to be uſed?*

A. When ſmall Names are to be brought into great; as Shillings into Pounds, or Hours into Days; and this is called (though improperly) Reduction Aſcending.

Note, *Whether you multiply or divide, it muſt be by as many of the leſs, as make one of the greater Denomination.*

Q. *How are Queſtions in Reduction proved?*

A. By varying the Order of them.

Of MONEY.

REDUCTION *Deſcending.*

1. In 46 *l.* how many Shillings and Pence? *Anſw.* 920 *s.* 11040 *d.*

$$\begin{array}{r} 46\,l. \\ 20 \\ \hline 920\,s. \\ 12 \\ \hline 11040\,d. \\ \hline \end{array}$$

2. In 7 *l.* how many Shillings and Pence? *Anſw.* 140 *s.* 1680 *d.*

3. In 9 *l.* how many Shillings, Pence and Farthings? *Anſw.* 180 *s.* 2160 *d.* 8640 *qrs.*

4. In 7 *l.* 14 *s.* 6 *d.* $\frac{1}{4}$, how many Farthings? *Anſw.* 7417 *qrs.*

5. Reduce 46 *l*, 14 *s.* 9 *d.* $\frac{3}{4}$, into *qrs.* *Facit* 44871 *qrs.*

6. Reduce 50 *l.* 9 *s.* 9 *d.* $\frac{1}{2}$, into Half-pence? *Facit* 24[illegible]35 *half-pence.*

7. Reduce 160 *l.* 15 *s.* 6 *d.* into Six-pences. *Facit* 6[illegible]1 *Six-pences.*

8. Re[illegible]

8. Reduce 48*l.* 12*s.* 8*d.* into Groats. *Facit* 2918 *Groats.*

9. Reduce 90 *l.* 17 *s.* 6 *d.* into Two-pences. *Facit* 10905 *Two pences.*

10. In 12 Crowns, how many Shillings and Pence? *Anſw.* 60 *s.* 720 *d.*

11. In 15 *l.* how many Crowns and Shillings? *Anſw.* 60 *Cr.* 300 *s.*

12. In 50 Half Crowns, how many Pence and Farthings? *Anſw.* 1500 *d.* 6000 *qrs.*

13. In 306 Crowns, how many Half Crowns and Pence? *Anſw.* 612 *half cr.* 18360 *d.*

14. Reduce 120 Six-pences, into Three-pences, Pence and Farthings. *Facit* 240 *three pences*, 720 *d.* 2880 *qrs.*

15. Reduce 210 Crowns, into Shillings, Groats and Pence. *Facit* 1050 *s.* 3150 *groats*, 12600 *d.*

16. Reduce 86 Pounds into Crowns, Shillings and Groats. *Facit* 344 *Cr.* 1720 *s.* 5160 *Groats.*

17. How many Shillings and Pence are in 17 Guineas? *Anſw.* 357 *s.* 4284 *d.*

18. How many Crowns and Six pences are in 28 Pounds? *Anſw.* 112 *Cr.* 1120 *Six pences.*

REDUCTION *Aſcending.*

1. In 11040 *d.* how many Shillings and Pounds? *Anſw.* 920 *s.* 46 *l.*

2|0

12)11040(92|0|46 *l.*

2. In 1680 *d.* how many Shillings and Pounds? *Anſw.* 140 *s.* 7 *l.*

3. In 8640 *qrs.* how many Pence, Shillings and Pounds? *Anſw.* 2160 *d.* 180 *s.* 9 *l.*

4. In 7417 *qrs.* how many Pounds? *Anſw.* 7 *l.* 14 *s.* 6 *d*$\frac{1}{4}$.

5. Reduce 44871 *qrs.* into Pounds. *Facit* 46 *l.* 14 *s.* 9 *d*$\frac{3}{4}$.

6. Reduce 24235 Half-pence into Pounds. *Facit* 50*l.* 9*s.* 9 *d*$\frac{1}{2}$.

7. Reduce 6431 Six-pences in Pounds. *Facit* 160*l.* 15*s.* 6 *d.*

8. Reduce 2918 Groats into Pounds. *Facit* 48*l.* 12*s.* 8*d.*

9. Reduce 10905 Two pences into Pounds. *Facit* 90 *l.* 17 *s.* 6 *d.*

10. In 720 *d.* how many Shillings and Crowns? *Anſw.* 60 *s.* 12 *Cr.*

11. In 300 *s.* how many Crowns and Pounds? *Anſw.* 60 *Cr.* 15 *l.*

12. In 6000 *qrs.* how many Pence and Half Crowns? *Anſw.* 1500 *d.* 50 *Half Crowns.*

13. In 18360*d.* how many half Crowns and Crowns? *Anſw.* 612 *Half Cr.* 306 *Cr.*

14. Reduce 2880 *qrs.* into Pence, Three-pences, and Six-pences. *Facit* 720 *d.* 240 *Three pences*, 120 *Six pences.*

15. Reduce 12600 *d.* into Groats, Shillings and Crowns, *Facit* 3150 *Groats*, 1050 *s.* 210 *Cr.*

16. Reduce 5160 Groats into Shillings, Crowns and Pounds. *Facit* 1720 *s.* 344 *Cr.* 86 *l.*

17. How many Shillings and Guineas are in 4284 Pence? *Anſw* 357 *s.* 17 *Guineas.*

18. How many Crowns and Pounds are in 1120 Six-pences? *Anſw.* 112 *Cr.* 28 *l.*

REDUCTION *Aſcending and Deſcending.*

1. In 720 Shillings how many Pence and Crowns? *Anſw.* 8640 *d.* 144 *Crowns.*

720 *s.*
12
——
6|0)864|0(144 *Crowns.*

2. In 120 Shillings, how many Crowns and Half Crowns? *Anſw.* 24 *Cr.* 48 *Half Cr.*

3. In 60 Crowns how many Shillings and Pounds? *Anſw.* 300 *s.* 15 *l.*

4. In 612 Half Crowns, how many Crowns and Pence? *Anſw.* 360 *Cr.* 18360 *d.*

5. In 40 Guineas, how many Shillings, Crowns and Pounds? *Anſw.* 840 *s.* 168 *Cr.* 42 *l.*

6. Reduce 12600 Pence into Shillings, Groats and Crowns. *Facit* 1050 *s.* 3150 *Gr.* 210 *Cr.*

7. Reduce 63 Crowns into Shillings and Guineas. *Facit* 315 *s.* 15 *Guineas.*

8. Reduce 70 Moidores into Pounds. *Facit* 94 *l.* 10 *s.*

9. Reduce 12180 Three-pences into Shillings, Pence and Groats. *Facit* 3045 *s.* 36540 *d.* 9135 *Gr.*

10. How many Crowns, Groats and Pounds are in 1720 Shillings? *Anſw.* 344 *Cr.* 5160 *Gr.* 86 *l.*

11. How many Groats, Three-pences, and Six pences are in 121 Shillings? *Anſw.* 363 *Groats.* 484 *Three-pences*, 242 *Six pences.*

12. How many Pounds and Crowns are in 1120 Six-pences? *Anſw.* 28 *l.* 112 *Cr.*

13. How many Crowns, Half Crowns and Shillings are in 280 *l.* and the Number of each equal? *Anſw.* 658 and 7 *s.* over.

14. Four Men brought each 17 *l.* 10 *s.* Value in Gold into the Mint to be coined into Guineas, how many muſt they have? *Anſw.* 66 *Guineas,* 14 *s.*

15. There are 12 Purſes with each 12 Guineas, how much Sterling is the Sum? *Anſw.* 151 *l.* 4 *s.*

16. A certain Ground Tenant was behind with his Landlord for 16 Years Rent, at 5 *l.* 10 *s.* a Year, how much was the Debt? *Anſw.* 88 *l.*

17. There are 34 *l.* 17 *s.* to be divided among 17 Men, how much is it a piece? *Anſw.* 2 *l.* 1 *s.*

18. In 19 Moidores, how many Pounds Sterling? *Anſw.* 25 *l.* 13 *s.*

Of TROY-WEIGHT.

1. In 47 *lb.* 10 *oz.* how many Grains? *Anſw.* 275520 *gr.*

2. In 47128 Grains of Gold, how many *lb*? *Anſw.* 8 *lb.* 2 *oz.* 3 *dwts.* 16 *gr.*

3. In 10 *lb* of Silver, how many Spoons, each 5 *oz.* 10 *dwts*? *Anſw.* 21 *Spoons,* and 19 *dwts.* over.

4. In 4560 Grains of Gold, how many Tea-ſpoons, each half an Ounce? *Anſw.* 19 *Tea-ſpoons.*

5. In 47 Salvers, each 20 *oz.* how many *lb*? *Anſw.* 78 *lb.* 4 *oz.*

6. How many Porringers, each 11 *oz.* are in 19 *lb.* 10 *oz.* 11 *dwts.* of Silver? *Anſw.* 21 *Porringers,* and 151 *dwts.* over.

7. A Goldſmith having 3 Ingots of Silver, each weighing 27 *oz.* was minded to make them into Spoons of 2 *oz.* Cups of 5 *oz.* Salts of 1 *oz.* and Snuff boxes of 2 *oz.* and to have an equal Number of each; the Queſtion is, what was that Number? *Anſw.* 8 of each ſort, and 1 *oz.* over.

8. In 17 Ingots of Silver, each 27 *oz.* 10 *dwts.* how many Grains? *Anſw.* 224400 *gr.*

Of AVOIRDUPOIS-WEIGHT.

Q. *Which are the Allowances uſually made in Avoirdupois great weight to the Buyer?*

A. They are Tare, Trett, and Cloff.

Q. *What is Tare?*

A. Tare is an Allowance made to the Buyer, for the Weight of the Box, Bag, Veſſel, or whatever elſe contains the Goods bought; and is either,

1. At ſo much *per* Bag, Barrel, Box, &c.
2. At ſo much *per Cent.* or,
3. At ſo much in the Groſs Weight, called Invoice Tare.

Q. *What is Trett?*

A. Trett is an Allowance, made by the Merchant to the Buyer, of 4 *lb.* in 104 *lb.* that is, the ſix and twentieth Part for Waſte and Duſt, in ſome ſort of Goods.

Note 1. *If any allowance be made both for Tare and Trett, in the ſame Parcel of Goods, the Tare is firſt to be deducted*; *and that Remainder is called Suttle Weight.*

Q. *What is Cloff?*

A. Cloff is an Allowance of 2 *lb.* Weight to the Citizens of London, on every draught above 3 *C.* Weight, on ſome ſorts of Goods; as Galls, Madder, Sumac, Argol, *&c.*

Q. *What are theſe Allowances called beyond the Seas?*

A. They are called the Courteſies of London; becauſe they are not practiſed in any other Places.

Q. *What is Groſs Weight?*

A. Groſs is the Weight of any ſort of Merchandize, and that which contains it, being weighed both together.

Q. *What is Neat Weight?*

A. Neat is the pure of the Goods, after all Allowances are deducted.

Note 1. *Raw, Long-Short, China, Morea Silk,* &c. *are weighed by a great Pound of* 24 oz. *But Ferret, Fioſella, Sleeve-Silk,* &c. *by the common Pound of* 16 oz.

2. *To bring great Pounds into common, multiply by* 3, *and divide by* 2.

3. *To bring common Pounds into great, multiply by* 2, *and divide by* 3.

CASE 1.

EXAMPLES.

1. In 7 *C.* 3 *qrs.* 10 *lb.* how many Ounces and Drams? *Anſw.* 14048 *oz.* 224768 *dr.*

2. In 3 Tons of Iron, how many *C. qrs.* and *lb*? *Anſw.* 60 *C.* 240 *qrs.* 6720 *lb.*

3. In 14048 *oz.* how many *C*? *Anſw.* 7 *C.* 3 *qrs.* 10 *lb.*

4. In 6720 *lb.* of Iron, how many Tons? *Anſw.* 3 *Tons.*

5. In 461 great Pounds of Morea Silk, how many Ounces and Drams? *Anſw.* 11064 *oz.* 177024 *dr.*

6. In 40426 Drams of Silk, how many great Pounds? *Anſw.* 105 *great pounds,* 6 *oz.* 10 *dr.*

7. In 3 *lb.* of Cinnamon, how many Parcels, each 12 *oz*? *Anſw.* 4 *parcels.*

8. In 470 Parcels of Sugar, each 26 *lb,* how many *C*? *Anſw.* 109 *C.* 0 *qrs.* 12 *lb.*

9. In 672 great Pounds of Silk, how many common Pounds? *Anſw.* 1008 *common lb.*

10. In 480 common Pounds of Silk, how many great Pounds? *Anſw.* 320 *great lb.*

11. In 8 Hogſheads of Tobacco, each weighing neat 7 *C.*½, how many Pounds? *Anſw.* 6720 *lb.*

12. In 17 Pigs of Lead, each weighing 4 *C.*¾, how many Fother, at 19 *C* ½? *Anſw.* 4 *Fother,* 2 *C.* 3 *qrs.*

13. In 712 *C.* of Lead, how many Fother? *Anſw.* 36 *Fother,* 10 *C.*

14. In 17 *C.* 1 *qr.* 6 *lb.* of Sugar, how many Parcels, each 17 *lb*? *Anſw.* 114 *parcels.*

CASE 2.

Of TARE *and* TRETT, *&c.*

Note, *If the Teacher approves of it, he may introduce this and the following Caſes, after Practice inſtead of this Place.*

Q. *When the Tare is at ſo much per Barrel, Bag,* &c. *how is the neat Weight found?*

A. Multiply the Number of the ſaid Barrels, Bags, *&c.* by the Tare, and ſubtract that Product from the Groſs; the Remainder is the Neat.

Note 1. *The Table of Allowance, for Tare, in the Book of Rates ſays;—For Cyprus and Smyrna Silk.*

Bales	*about or above* 300 *lb.*	*The Tare per Bale is*	16
	from 300 *to* 200		14
	from 200 *downwards*		12

For Virginia Tobacco.

Hhds	5 *C. and upwards*	*The Tare per Hhd. is*	100
	from 5 *to* 4 *C.*		90
	from 4 *to* 3 *C.*		80
	under 3 *C.*		70

Sugar from India.

In Caſks and Caniſters	*Tare*	⅙
In Cheſts and Caſks from St Thome		⅕

Oil from Candia.

Tare 29 *lb. per Barrel.*

2. 7 *lb.*½ *of Oil make a Gallon; therefore to reduce Pounds into Gallons multiply by* 2 *and divide by* 15.

EXAMPLES.

1. In 16 Hogſheads of Tobacco, each 5 *C.* 1 *qr.* 19 *lb.* Groſs, Tare *per* Hogſhead 100 *lb.* how much Neat Weight? *Anſw.* 72 *C.* 1 *qr.* 20 *lb.*

```
                                  C.  qr.  lb.
                                  5   1    19
                                           4 by the Parts.
                                 ------------
   16                             21  2    20
   100                                      4
  ——4  C.  qr.  lb.              ------------
28)1600(57(14  1   4       Groſs  86  2    24
                            Tare  14  1     4
                                 ------------
                            Neat  72  1    20
                                 ------------
```

2. In 70 Bales of Smyrna Silk, each 317 *lb.* Groſs, Tare *per* Bale 16 *lb.* how many *lb.* Neat? *Anſw.* 21070 *lb. Neat.*

3. In 14 Hogſheads of Tobacco, weighing Groſs 89 *C.* 3 *qrs* 17 *lb.* Tare *per* Hogſhead 100 *lb.* how much neat Weight? *Anſw.* 77 *C.* 1 *qr.* 17 *lb.*

4. What is the Neat Weight of 30 Bales of Cyprus ſilk, each weighing 249 *lb.* Groſs, Tare *per* Bale 14 *lb*? *Anſw.* 7050 *lb.*

CASE 3.

Q. *When the Tare is at ſo much per Cent. how is the Neat Weight found?*

A, When the Tare is an aliquot Part or Parts of the *C.* Weight, divide the whole Groſs by the ſaid Part or Parts that the Tare is of an *C.* Weight, and the Quotient thence ariſing, gives the Tare of the Whole; which ſubtract from the whole Groſs, the Remainder is Neat.

Note 1. *Figs, Almonds, Argol,* &c. - 14 *lb.*
Caroteels, Butts, of Currants, &c 16
Oil in uncertain Caſks, &c. - 18 } *per Cent.*

2. *Whatever Part the given Tare is of an C. Weight, the ſame muſt the whole Tare be of the given Groſs Weight.*

EXAMPLES.

1. What is the Neat Weight of 12 Barrels of Argol, Groſs 48 *C.* 3 *qrs.* 12 *lb.* Tare 14 *lb. per Cent*? *Anſw.* 42 *C.* 3 *qrs.*

```
         C.  qrs.  lb.
14=⅛)48   3   12 Groſs
      6   0   12 Tare
    ---------------
     42   3    0
    ---------------
```

2. In 12 Butts of Currants, each 7 *C.* 1 *qr.* 10 *lb.* Groſs, Tare *per Cent.* 16 *lb.* how much Neat Weight? *Anſw.* 75 *C.* 1 *qr.* 26 *lb.* 14 *oz.*

3. What is the Neat Weight of 30 Barrels of Figs, each 2 *C.* 3 *qrs.* Groſs, Tare *per cent* 14 *lb*? *Anſw.* 72 *C.* 21 *lb.*

Note, When the Tare is not the aliquot Part or Parts of an C. Weight, then multiply the Pounds Groſs, by the Tare per Cent. given, and that Product divide by 112, the Quotient is the whole Tare, which ſubtract from the Groſs, the Remainder is Neat.

4. What is the Neat Produce of 20 Barrels of Anchovies, each Groſs 33 *lb.* Tare *per cent.* 10 *lb*? *Anſw.* 601 *lb.* 2 *oz.*

5. What is the neat produce of 17 barrels of Pot-Aſh, each Groſs 203 *lb.* Tare 10 *lb. per cent*? *Anſw.* 3142 *lb.* 14 *oz.*

CASE 4.

Q. *When the Tare is at ſo much in the whole Groſs Weight, how is the Neat Weight found?*

A. Subtract the Tare from the Groſs, and the Remainder is Neat.

EXAMPLES.

1. What is the Neat Weight of 38 Hogſheads of Tobacco, weighing Groſs 201 *C.* 3 *qrs.* 12 *lb.* Tare in the whole 3140 *lb.* *Anſw.* 173 *C.* 3 *qrs.* 8 *lb.*

2. What is the Neat Weight of 3 Hogſheads of Tobacco, weighing as follows, *viz.*

No	*C.*	*qrs.*	*lb.*	Tare *lb.*
1	3	1	2	80
2	3	2	1	80
3	5	1	12	100 ?

Anſw. 9 *C.* 3 *qrs.* 7 *lb.*

CASE 5.

Q. *How is the Neat Weight found, when Trett is allowed with Tare?*

A. Divide the Pounds Suttle by 26, the Quotient is the Trett, which ſubtract from the Suttle, the Remainder is Neat.

EXAMPLES.

1. In 8 *C.* 3 *qrs.* 20 *lb.* Groſs, Tare 38 *lb.* Trett 4 *lb. per* 104 *lb.* how many *lb* Neat? *Anſw.* 925 *lb. Neat.*

2. In 177 *C.* 0 *qrs.* 22 *lb.* Groſs, Tare 9 *lb. per cent.* Trett 4 *lb. per* 104 *lb.* how many *C.* Weight Neat? *Anſw.* 156 *C.* 2 *qrs.* 22 *lb.*

3. In 17 Cheſts of Sugar, weighing 120 *C.* 2 *qrs.* Groſs, Tare 176 *lb.* Trett 4 *lb. per* 104 *lb.* how many *C.* Weight Neat? *Anſw.* 114 *C.* 1 *qr.* 12 *lb.*

Note, There are other Allowances, not ſo common, ſuch as Break, which is at ſo much per Barrel, Bag, &c. and Damage, which is ſo much in the whole, but they are very eaſy.

Of APOTHECARIES-WEIGHT.

1. In 12 lb. 1 oz. 2 dr. 0 ſcr. 1 gr. how many Grains? *Anſw.* 69721 *Grains.*

2. In 69721 Grains, how many lb? *Anſw.* 12 lb. 1 oz. 2 dr. 0 ſcr. 1 gr.

Of LONG-MEASURE.

1. In 70 Miles, how many Furlongs and Poles? *Anſw.* 560 *Furlongs*, 22400 *Poles.*

2. In 40 Yards, how many Feet, Inches and Barley-corns? *Anſw.* 120 *Feet* 1440 *Inches*, 4320 *Barley-corns.*

3. In 5 Miles, how many Barley-corns? *Anſw.* 950400 *Barley corns.*

4. In 4000 Inches how many Yards? *Anſw.* 111 *Yds.* 4 *In.*

5. In 4 Leagues how many Yards? *Anſw.* 21120 *Yards.*

6. In 15840 Yards, how many Miles and Leagues? *Anſ.* 9 *Miles*, 3 *Leagues.*

7. How many Barley-corns are in a Mile? *Anſw.* 190080 *Barley-corns.*

8. How many times doth the Wheel, which is 18 Feet 6 Inches round, turn between London and York, which is 150 Miles? *Anſw.* 42810 *times*, and 180 *Inches* over.

9. How many Barley corns will reach round the Globe of the Earth, which is 360 Degrees, and each Degree 69 Miles and an half? *Anſw.* 4755801600 *Barley corns.*

Of CLOTH-MEASURE.

1. In 14 Yards, how many Quarters and Nails? *Anſw.* 56 *qrs.* 224 *nails.*

2. In 17 *yds.* 1 *qr.* 2 *na.* how many Nails? *Anſw.* 278 *na.*

3. In 4712 Nails, how many Yards? *Anſw.* 294 *yds.* 2 *qrs.*

4. In 47128 Nails of Iriſh Cloth, how many Pieces, each 12 Yards? *Anſw.* 245 *Pieces*, 5 *yds.* 2 *qrs.*

5. In 4 Pieces of Cloth, each 14 Yards, how many Quarters and Nails? *Anſw.* 224 *qrs.* 896 *Nails.*

6. In 10 Bales of Cloth, each 10 Pieces, each 12 Yards, how many Yards? *Anſw.* 1200 *Yards.*

7. In 7000 Nails of Holland, how many Ells? *Anſ.* 350 *Ells.*

8. Reduce 42 Ells into Quarters and Nails. *Facit* 210 *qrs.* 840 *Nails.*

Of LAND-MEASURE.

1. In 40 Acres how many Roods and Perches? *Anſw.* 160 *Roods*, 6400 *Perches.*

2. In 17 *A.* 3 *r.* 10 *p.* how many Perches? *Anſw.* 2850 *per.*

3. Reduce 2850 Perches into Acres. *Facit* 17 *A.* 3 *r.* 10 *p.*

4. If a Piece of ground contains 24 Acres, and an Incloſure of 17 Acres 3 Roods be taken out of it, how many Perches are there in the Remainder? *Anſw.* 1000 *Perches.*

5. One Field contains 7 acres, another 10 acres, and a third 12 acres 1 rood, how many Shares of 76 perches each are contained in the whole? *Anſw.* 61 *Shares*, and 44 *Perches* over.

Of LIQUID-MEASURE.

1. In 17 Gallons how many Quarts and Pints? *Anſw.* 68 *qts.* 136 *pints.*

2. In 10 Barrels of Beer, how many Gallons and Quarts? *Anſw.* 360 *Gals* 1440 *qts.*

3. In 4 Barrels of Ale how many Gallons? *Anſw.* 128 *gal.*

4. In 72 Hogſheads of Beer, how many Barrels? *Anſw.* 108 *Barrels.*

5. In 91 Barrels of Beer, how many Hogſheads? *Anſw.* 60 *hhds.* 36 *gals.*

6. If a Back contains 30 Barrels of Beer, how many Gallons doth it hold? *Anſw.* 1080 *gals.*

7. In 4 Tuns of Oil, how many Hogſheads, Gallons, and Quarts? *Anſw.* 16 *hhds.* 1008 *gals.* 4032 *qts.*

8. In 3 Hogſheads of Brandy how many half Anchors? *Anſw.* 37 *half anchors*, 4 *gals.*

9. In 1712 Gallons of Wine, how many Hogſheads? *Anſ.* 27 *hhds*, 11 *gals.*

10. If a Vintner be deſirous to draw off a Pipe of Canary into Bottles, containing Pints, Quarts, and 2 Quarts, and of each an equal Number, how many muſt he have? *Anſ.* 144 *of each ſort.*

Of DRY-MEASURE.

1. In 40 Quarters of Wheat, how many Buſhels and Pecks? *Anſw.* 320 *Buſhels*, 1380 *Pecks.*

2. Reduce 1280 pecks of wheat into quarters. *Facit* 40 *qrs.*

3. In 30 Chaldron of Coals, each 36 Buſhels, how many Pecks? *Anſw.* 4320 *Pecks.*

4. Reduce 7094 Pecks of Coals into Chaldrons. *Facit* 49 *Chal.* 9 *Buſh.* 2 *Pecks.*

Of TIME.

1. In 121812 Seconds, how many Hours? *Anſw.* 33 *hrs.* 50 *min.* 12 *ſec.*

2. Reduce 41 Weeks into Days, Hours, and Minutes. *Facit* 287 *days*, 6888 *hours*, 413280 *min.*

3. Reduce 413280 Minutes into Weeks. *Facit* 41 *Weeks.*

4. How many Seconds in a Year, allowing it to be 365 Days, 6 Hours? *Anſw.* 31557600 *Seconds.*

5. How many Days have paſſed ſince the Birth of Chriſt, to Chriſtmas 1768? *Anſw.* 645762 *Days.*

6. From March 2 to November 19 following (incluſive) how many Days? *Anſ.* 263 *Days.*

Of MOTION.

In half a Year's time the Sun makes his Progreſs through 6 Signs of the Zodiac, how many Degrees, Minutes, and Seconds doth that amount to? *Anſw.* 180 *Degrees,* 10800 *Min.* 648000 *Sec.*

Of the SINGLE RULE *of* THREE.

Q. *HOW many Parts are there in the Rule of Three?*

A. Two: Single or Simple, and Double or compound.

Q. *By what is the Single Rule of Three known?*

A. By three Terms, which are always given in the Queſtion to find a fourth.

Q. *Are any of the Terms given to be reduced from one Denomination to another?*

A. If any of the given Terms be of ſeveral Denominations, they muſt be reduced into the loweſt Denomination mentioned.

Q. *What do you obſerve concerning the firſt and third Terms?*

A. They muſt be of the ſame Name and Kind.

Q. *What do you obſerve concerning the fourth Term?*

A. It muſt be of the ſame Name and kind with the Second.

Q. *What do you obſerve of the three given Terms taken together?*

A. That the two firſt are a Suppoſition, the laſt is a Demand.

Q. *How is the third Term known?*

A. It is known by theſe, or the like words, What coſt? How many? How much?

Q. *How many ſorts of Proportion are there?*

A. Two: Direct and Inverſe.

Of DIRECT PROPORTION.

Q. *What is Direct Proportion?*

A. Direct Proportion is when more requires more, or leſs requires leſs.

Q. *What do you mean by more requires more?*

A. More requires more, is when the third Term is greater than the firſt; and therefore requires the fourth Term to be greater than the ſecond in the ſame Proportion.

Q. *What do you mean by leſs requires leſs?*

A. Leſs requires leſs, is when the third Term is leſs than the firſt; and therefore requires the fourth Term to be leſs than the ſecond in the like Proportion.

Q. *How is the fourth Term in Direct Proportion found?*

A. By multiplying the ſecond and third Terms together, and dividing that Product by the firſt Term.

Q. *What Proportion does the fourth Number bear to any other?*

A. It bears the ſame Proportion to the ſecond, as the Third does to the Firſt.

Q. *How do you prove Queſtions in the Rule of Three Direct?*

A. By changing their Order.

EXAMPLES.

1. If 3 *oz.* of Silver coſt 17 *ſ.* what will 48 *oz.* coſt? *Anſw.* 13 *l.* 12 *ſ.*

```
          oz.   ſ.   oz.
           3 : 17 : : 48
                      17
                ———— 2|0    l.   ſ.
            3)816(27|2(13   12
```

2. If 3 *lb.* of Ginger coſt 3 *ſ.* what coſt 26 *lb*? *Anſ.* 1 *l.* 6 *ſ.*

3. If 2 *oz.* of Silk coſt 2 *ſ.* 6 *d.* what coſt 7 *lb*? *Anſw.* 7 *l.*

4. If 1 Gallon of Ale coſt 8 *d.* what coſt 36 Gallons? *Anſw.* 1 *l.* 4 *ſ.*

5. If 1 *lb.* of Sugar coſt 4 *d*,½. what coſt 48 *lb*? *Anſw.* 18 *ſ.*

6. If 1 *lb.* of Sugar coſt 4*d.* what coſt 1 *C*? *Anſ.* 1 *l.* 17*ſ.* 4*d.*

7. If an *C.* of Sugar coſt 2 *l.* 12 *ſ.* what coſt 1 *lb*? *Anſw.* 5 *d.* 2 *qrs.* $\frac{32}{112}$.

8. If 1 gallon of Beer coſt 4*d.* what coſt a barrel? *Anſ.* 12*ſ.*

9. If 1 pair of Stockings coſt 2 *ſ.* 3 *d.* what coſt 19 dozen Pair? *Anſw.* 25 *l.* 13 *ſ.*

10. If 19 dozen Pair of Shoes coſt 25 *l.* 13 *ſ.* what coſt 1 Pair? *Anſw.* 2 *ſ.* 3 *d.*

11. Bought a Firkin of Butter, containing 56 *lb.* for 18 *ſ.* 8 *d.* what is that *per lb*? *Anſw.* 4 *d.*

12. Sold 3 *C.* Weight of Tobacco, at 18 *d. per lb.* what is the Price of the whole? *Anſw.* 25 *l.* 4 *ſ.*

13. Bought 19 Chaldron of Coals, at 29 *ſ.* 6 *d. per* Chaldron, what come they to? *Anſw.* 28 *l.* 0 *ſ.* 6 *d.*

14. If 1 *lb.* of Sugar coſt 9 *d.* what coſt 17 *C.* 2 *qrs*? *Anſ.* 73 *l.* 10 *ſ.*

15. If 1 *oz.* of Silver coſt 5 *ſ.* 6 *d.* what is the Price of a Tankard that weighs 1 *lb.* 10 *oz.* 10 *dwts.* 4 *gr*? *Anſw.* 6 *l.* 3 *ſ.* 9 *d.* 2 *qrs.* $\frac{96}{480}$.

16. If 1 *lb.* of Tobacco coſt 15 *d.* what coſt 3 *hhds.* weighing together 15 *C.* 1 *qr.* 19 *lb*? *Anſw.* 107 *l.* 18 *ſ.* 9 *d.*

17. If a Yard of Cloth is worth 14 *ſ.* what is the worth of 5 Pieces, each 19 Yards? *Anſw.* 66 *l.* 10 *ſ.*

18. If an Ell of Holland coſt 4 *ſ.* 6 *d.* what is the Value of 5 Pieces, each 12 Ells? *Anſw.* 13 *l.* 10 *ſ.*

19. If a Buſhel of Coals coſt 10 *d.* how many Chaldron for 100 *l*? *Anſw.* 66 *Ch.* 24 *Buſh.*

20. How many Quarters of Corn for 40 Guineas, at 4 *s.* *per* Buſhel? *Anſw.* 26 *qrs.* 2 *buſh.*

21. If a Man's yearly income be 300 *l.* what is it *per* Day? *Anſw.* 16 *s.* 5 *d.* 1 *qr.* $\frac{15}{365}$.

22. If a Man ſpend 7 Pence *per* Day, how much is that in a Year? *Anſw.* 10 *l.* 12 *s.* 11 *d.*

23. If a Pint of Wine coſt 10 *d.* what coſt 3 *hhds*? *Anſw.* 63 *l.*

24. If a Pipe of Canary coſt 40 *l.* how much is that *per* Pint? *Anſw.* 9 *d.* 2 *qrs.* $\frac{96}{1008}$.

25. Bought 12 Pieces of Cloth, each 12 Yards, at 10 *s.* 6 *d.* *per* Yard, what come they to? *Anſw.* 75 *l.* 12 *s.*

26. What coſt 120 Yards of Cloth, at 3 *s.* *per* Yd? *Anſ.* 18 *l.*

27. A Merchant bought 4 Pieces of Holland, each 12 Ells, for 7 *l.* 10 *s.* what did 1 Ell coſt? *Anſw.* 3 *s.* 1 *d* $\frac{1}{2}$.

28. A Grocer bought 3 *hhds.* of Sugar, each 10 *C.* 3 *qrs.* 12 *lb.* Groſs, Tare 26 *lb.* *per hhd.* at 2 *d.* $\frac{1}{2}$ *per lb.* I demand what the 3 *hhds.* came to? *Anſw.* 37 *l.* 3 *s.* 9 *d.*

29. How much muſt I pay for the Carriage of 10 *C.* $\frac{1}{2}$, at the Rate of 1 *d* $\frac{1}{2}$ *per lb*? *Anſw.* 7 *l.* 7 *s.*

30. If 6 Horſes eat up 21 Buſhels of Oats in a Week's time, how many Buſhels will ſerve 20 Horſes the ſame time? *Anſw.* 70 *Buſhels.*

31. If a Family of 10 Perſons ſpend 3 Buſhels of Malt in a Month, how many Buſhels will ſerve them, when they are 30 in a Family? *Anſw.* 9 *Buſh.*

32. If an Ingot of Silver weighs 36 *oz.* 10 *dwts.* what is it worth, at 5 *s.* *per oz*? *Anſw.* 9 *l.* 2 *s.* 6 *d.*

33. How many Yards of Lace for 100 *l.* at 3 *s.* 6 *d.* *per* Yard? *Anſw.* 571 *yds.* $\frac{18}{42}$.

34. If a Merchant hath owing to him 1000 *l.* and his Debtor doth agree to pay him for every Pound 12 *s.* 6 *d.* I demand how much he muſt pay in all? *Anſw.* 625 *l.*

35. A Goldſmith ſold a Tankard for 10 *l.* 12 *s.* at the Rate of 5 *s.* 4 *d.* *per oz.* I demand the weight of it? *Anſw.* 39 *oz.* 15 *dwts.*

36. A Man bought a Piece of Cloth for 16 *l.* 10 *s.* at 15 *s.* *per* Yard, how many Yards did it contain? Anſw. 22 *yds.*

37. If 1 *C.* Weight of Cheeſe coſt 37 *s.* 4 *d.* what is that *per lb*? Anſw. 4 *d.*

38. Coals at 33 *s.* *per* Chaldron, how much *per* Buſhel? Anſw. 11 *d.*

39. What coſt 49392 Caſe Knives, at 4 *s.* 4 *d. per* Dozen? *Anſw.* 891 *l.* 16 *s.*

40. If a Gentleman has an Eſtate of 245 *l.* 10 *s.* a Year, how much may he ſpend one Day with another, to lay up 60 Guineas at the Year's end? *Anſw.* 10 *s. per Day.*

41. If 17 *C.* 3 *qrs.* 14 *lb.* of Tobacco coſt 133 *l.* 13 *s.* 4 *d.* what coſt 10 *oz*? *Anſw.* 1 *d.*

42. If 1 *C.* Weight of Lead coſt 15 *s.* 11 *d.* what coſt 5 Fother? *Anſw.* 77 *l.* 11 *s.* 0 *d* ½.

43. When the Tun of Wine coſt 42 *l.* what coſt 1 Quart? *Anſw.* 10 *d.*

44. At a Noble *per* Week, how many months Board may I have for 50 *l*? *Anſ.* 37 *Months*, 2 *Weeks.*

45. What coſt a Pack of Wool, weighing 2 *C.* 1 *qr.* 19 *lb.* at 8 *s.* 6 *d. per* Stone? *Anſw.* 8 *l.* 4 *s.* 6 *d.* 1 *qr.* $\frac{10}{14}$.

46. What is Cheeſe *per C.* Weight, at 3 *d.*½ *per lb*? *Anſw.* 1 *l.* 12 *s.* 8 *d.*

47. If a Yard of Cambric coſt 12 *s.* what coſt 4 Pieces, each 20 Yards? *Anſw.* 48 *l.*

48. If a Yard of Broad Cloth coſt 18 *s.* what coſt 5 Pieces, each 20 Yards? *Anſw.* 90 *l.*

49. If Lead be ſold for 1 *d.*½ *per lb.* what is 3 *C.* Weight worth? *Anſw.* 2 *l.* 2 *s.*

50. If Coffee be ſold for 8 *d.*¼ *per oz.* what is 6 *C.* Weight worth? *Anſw.* 369 *l.* 12 *s.*

Of INVERSE PROPORTION.

Q. *What is Inverſe Proportion?*

A. Inverſe Proportion is when more requires leſs, or leſs requires more.

Q. *What is meant by more requires leſs?*

A. More requires leſs is when the third Term is greater than the firſt, and requires the fourth Term to be leſs than the ſecond.

Q. *What is meant by leſs requires more?*

A. Leſs requires more is when the third Term is leſs than the firſt, and requires the fourth Term to be greater than the ſecond.

Q. *How is the fourth Term in Inverſe Proportion found?*

A. By multiplying the firſt and ſecond Terms together, and dividing that Product by the third Term.

Q. *What Proportion does the fourth Term bear to any of the reſt?*

A. It bears ſuch Propnrtion to the Second, as the Firſt does to the Third.

EX-

EXAMPLES.

1. If 48 Men can build a Wall in 24 Days, how many Men can do the ſame in 192 Days? Anſw. 6 *Men.*

2. If I lent my Friend 100 *l.* for 6 Months (allowing the Month to be 30 Days) how long ought he to lend me 1000*l.* to requite my Kindneſs? Anſw. 18 *Days.*

3. If 100 *l.* in 12 Months gain 6 *l.* Intereſt, what Principal will gain the ſame in 8 Months? Anſw. 150 *l.*

4. If a Footman performs a journey in 3 Days, when the Days are 16 Hours long, how many Days will he require of 12 Hours long, to go the ſame journey in? Anſw. 4 *Days.*

5. How many Yards of Matting, that is half Yard wide, will cover a Room that is 18 Feet wide, and 30 Feet long? Anſw. 120 *Yards.*

6. If 28 *s.* will pay for the Carriage of an *C.* Weight 150 Miles, how far may 6 *C.* Weight be carried for the ſame Money? Anſw. 25 *Miles.*

7. How much in Length, that is 3 Inches broad, will make a Foot ſquare? Anſw. 48 *Inches.*

8. If 15 Shillings worth of Wine will ſerve 46 Men, when the Tun is worth 12 *l.* how many Men will the ſame 15 Shillings worth ſuffice, when the Tun is worth but 8 *l*? Anſw. 69 *Men.*

9. If when the Price of a Buſhel of Wheat is 6 *s.* 3 *d.* the Penny Loaf will weigh 9 *oz.* what muſt the Penny Loaf weigh, when Wheat is at 4 *s.* 6 *d.* the Buſhel? Anſ. 12 *oz.* 10 *dwts.*

10. Suppoſe 800 Soldiers were placed in a Garriſon, and their proviſions were computed ſufficient for 2 months, how many Soldiers muſt depart, that the Proviſions may ſerve them 5 Months? Anſw. 480 *Men.*

11. There is a Ciſtern, having a Cock, which will empty it in 12 Hours, I demand how many Cocks of the ſame Capacity, there muſt be to empty it in a Quarter of an Hour? Anſw. 48 *Cocks.*

12. There was a certain Building raiſed in 8 Months by 120 Workmen, but the ſame being demoliſh'd, it is required to be rebuilt in 2 Months; I demand how many Men muſt be employed about it? Anſw. 480 *Men.*

13. A Piece of Tapeſtry is 3 Ells Flemiſh wide, and 4 Ells Flemiſh long, and it is required to be lined with ſomething that is but 3 quarters of a Yard wide; I demand how many Yards there muſt be to compleat the lining? Anſw. 9 *Yards.*

Of PRACTICE.

Q. W*HAT is Practice?*

A. It is a ſhort way of finding the Value of any quantity of Goods, by the given Price of one Integer.

Q. *How do you prove Queſtions in Practice?*

A. By the Single Rule of Three Direct: Or Practice may be proved by itſelf, by varying the Parts.

The TABLES.

s.	d.	l.	s.	d.	l.	s.	d.	C.wt.	lb.
$\frac{1}{2}$ is	6	$\frac{1}{2}$ is	10	0	$\frac{1}{15}$	1	4	$\frac{1}{2}$	56
$\frac{1}{3}$	4	$\frac{1}{3}$	6	8	$\frac{1}{16}$	1	3	$\frac{1}{4}$	28
$\frac{1}{4}$	3	$\frac{1}{4}$	5	0	$\frac{1}{20}$	1	0	$\frac{1}{7}$	16
$\frac{1}{6}$	2	$\frac{1}{5}$	4	0	$\frac{1}{30}$	0	8	$\frac{1}{8}$	14
$\frac{1}{8}$	$1\frac{1}{2}$	$\frac{1}{6}$	3	4	$\frac{1}{40}$	0	6	$\frac{1}{14}$	8
$\frac{1}{12}$	1	$\frac{1}{8}$	2	6	$\frac{1}{60}$	0	4	$\frac{1}{16}$	7
		$\frac{1}{10}$	2	0	$\frac{1}{80}$	0	3		
		$\frac{1}{12}$	1	8	$\frac{1}{120}$	0	2		

CASE I.

Q. *What muſt be done with the Price of an Integer, when it is leſs than a Penny?*

A. Find the aliquot Parts of that Price contained in a Penny, which muſt be Diviſors to the given Sum; that is, if the Price be a Farthing, ſay a Farthing is the fourth of a Penny, and ſet it thus, $\left|\frac{1}{4}\right|\frac{1}{4}\right|$. If the Price be a Halfpenny, then ſay a Halfpenny is the half, thus, $\left|\frac{1}{2}\right|\frac{1}{2}\right|$. If it is three Farthings, then ſay, a Halfpenny is the half of a Penny, and a Farthing is the fourth of a Penny, thus, $\left|\begin{array}{c|c}\frac{1}{2} & \frac{1}{2}\\ \frac{1}{4} & \frac{1}{4}\end{array}\right.$

Q. *What do you obſerve concerning theſe Columns?*

A. The firſt Column contains the Money, and the other the Parts.

Note 1. When there are more aliquot Parts than one, their Quotients muſt be added together, and the Sum, if the firſt aliquot Part be taken from a Penny, will be Pence; if it be taken from a Shilling, will be Shillings; or if it be taken from a Pound, will be Pounds.

2. It is frequently better to take Parts of Parts than Parts of the whole price; and then the three Farthings above-mentioned may as well be taken thus, $\left|\begin{array}{c|c}\frac{1}{2} & \frac{1}{2}\\ \frac{1}{4} & \frac{1}{2}\end{array}\right|$ that is, a halfpenny is the half of a penny; and a Farthing is the half of a Halfpenny.

EXAMPLES.

¼ | ¼ | 7612 at ¼
12 | 1903
2|0 | 151|8
7*l.* 18*s.* 7*d.*

½ | ½ | 6812 at ½.
12 | 3406
2|0 | 28|3 10
14*l.* 3*s.* 10*d.*

½ ¼ | ½ | 4712 at ¾.
½ | 2356
1178
12 | 3534
2|0 | 29|4 6
14*l.* 14*s.* 6*d.*

1280 at ¼
Facit 1*l.* 6*s.* 8*d.*

7672 at ½
Facit 15*l.* 19*s.* 8*d.*

9280 at ¾
Facit 28*l.* 13*s.* 9*d.*

CASE 2.

Q. *What muſt be done with the price of an Integer, when it is leſs than a Shilling?*

A. Find the aliquot Parts of that Price contain'd in a Shilling, which muſt be Diviſors to the given Sum. Or thus,

If the given Price be not the aliquot Part of a Shilling, then firſt take ſome Part of it that is an aliquot Part; and for the remaining part of the Price, let it be taken out of the foregoing Part or Parts, and then add the Quotient together, as before, the Total will be the Anſwer in Shillings.

EXAMPLES.

1 | $\frac{1}{12}$ | 7612 at 1*d.*
2|0 | 63|4
31*l.* 14*s.* 4*d.*

1 ¼ | $\frac{1}{12}$ ¼ | 8612 at 1*d* ¼
717 8
179 5
2|0 | 89|7 1
44*l.* 17*s*, 1*d.*

6812 at 1*d.*
Facit 28*l.* 7*s.* 8*d.*

1861 at 1*d.*¼
Facit 9*l.* 13*s.* 10*d.*¼

4121 at 1*d.*½
Facit 25*l.* 15*s.* 1*d.*½

1861 at 1*d.*¾

Facit 13*l.* 11*s.* 4*d.*¾

4761 at 2*d.*

Facit 39*l.* 13*s.* 6*d.*

6181 at 2*d.*¼

Facit 57*l.* 18*s.* 11*d.*¼

1218 at 2*d.*½

Facit 12*l.* 13*s.* 9*d.*

8012 at 2*d.*¾

Facit 91*l.* 16*s.* 1*d.*

7612 at 3*d.*

Facit 95*l.* 3*s.*

6128 at 3*d.*¼

Facit 82*l.* 19*s.* 8*d.*

6180 at 3*d.*½

Facit 90*l.* 2*s.* 6*d.*

7812 at 3*d.*¾

Facit 122*l.* 1*s.* 3*d.*

8120 at 4*d.*

Facit 135*l.* 6*s.* 8*d.*

7000 at 4*d.*¼

Facit 123*l.* 19*s.* 2*d.*

6001 at 4*d.*½

Facit 112*l.* 10*s.* 4*d.*½

7121 at 4*d.*¾

Facit 140*l.* 18*s.* 8*d.*¾

7181 at 5*d.*

Facit 149*l.* 12*s.* 1*d.*

8121 at 5*d.*¼

Facit 177*l.* 12*s.* 11*d.*¼

6128 at 5*d.*½

Facit 140*l.* 8*s.* 8*d.*

6100 at 5*d.*¾

Facit 146*l.* 2*s.* 11*d.*

1000 at 6*d.*

Facit 25*l.*

7610 at 6*d.*¼

Facit 198*l.* 3*s.* 6*d.*½

1218 at 6*d.*½

Facit 32*l.* 19*s.* 9*d.*

6000 at 6*d.*¾

Facit 168*l.* 15*s.*

7101 at 7*d.*

Facit 207*l.* 2*s.* 3*d.*

1001 at 7*d.*¼

Facit 30*l.* 4*s.* 9*d* ¼

4100 at 7*d* ½

Facit 128*l.* 2*s.* 6*d.*

6120 at 7*d.*¾

Facit 197*l.* 12*s.* 6*d.*

7100 at 8*d.*

Facit 236*l.* 13*s.* 4*d.*

6100 at 8*d.*¼

Facit 209*l.* 13*s.* 9*d.*

8000 at 8*d.* ½

Facit 283*l.* 6*s.* 8*d.*

6000 at 8*d.*¾

Facit 218*l.* 15*s.*

9000 at 9*d.*

Facit 337*l.* 10*s.*

4121 at 9*d.*¼

Facit 158*l.* 16*s.* 7*d.*¼

6100 at 9*d* ½

Facit 241*l.* 9*s.* 2*d.*

5918 at 9*d* ¾

Facit 240*l.* 8*s.* 4*d.*½

8121 at 10*d.* †

Facit 338*l.* 7*s.* 6*d.*

6712 at 10*d.*¼

Facit 286*l.* 13*s.* 2*d.*

1002 at 10*d.*½

Facit 43*l.* 16*s.* 9*d.*

4680 at 10*d.*¾

Facit 209*l.* 12*s.* 6*d.*

1260 at 11*d.*

Facit 57*l.* 15*s.*

6121 at 11*d.*¼

Facit 286*l.* 18*s.* 5*d.*¼

1234 at 11*d.*½

Facit 59*l.* 2*s.* 7*d.*

2345 at 11*d.*¾

Facit 114*l.* 16*s.* 1*d.*¾

100 at 11*d.*¾

Facit 4*l.* 17*s.* 11*d.*

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† Note, When the Price of an Integer is 10 d. annex a Cypher to the given Number, and divide by 12 and by 20.

CASE

CASE 3.

Q. *What muſt be done with the price of an Integer, when it is greater than a Shilling, but leſs than two Shillings?*

A. Let the Part or Parts be taken only with ſo much of the given Price as is more than one Shilling; that is, if the Price be 14 *d.*½, take the Parts only with 2 *d.*½, and let the given Quantity ſtand for Shillings, which muſt be added with the reſt; and the total will be the Anſwer in Shillings.

EXAMPLES.

¼ ¼ | 4 8 6 at 12*d.*¼
1 2 1 ½
12 | 1 0 1½
4 9|6 1½
2|0 | 24*l.* 16*s.* 1*d*½

½ ½ | 4 8 6 at 12*d.*½
2 4 3
12 | 2 0 3
5 0|6 3
2|0 | 25*l.* 6*s.* 3*d.*

7612 at 12*d.*¼

Facit 388*l.* 10*s.* 7*d.*

1216 at 12*d.*½

Facit 63*l.* 6*s.* 8*d.*

1216 at 12*d.*¾

Facit 64*l.* 12*s.*

6121 at 13*d.*

Facit 331*l.* 11*s.* 1*d.*

1281 at 13*d.*¼

Facit 70*l.* 14*s.* 5*d.*¼

6100 at 13*d.*½

Facit 343*l.* 2*s.* 6*d.*

1210 at 13*d.*¾

Facit 69*l.* 6*s.* 5*d.*½

1210 at 14*d.*

Facit 70*l.* 11*s.* 8*d.*

1271 at 14*d.*¼

Facit 75*l.* 9*s.* 3*d.*¾

6120 at 14*d.*½

Facit 369*l.* 15*s.*

1210 at 14*d.*¾

Facit 74*l.* 7*s.* 3*d.*½

1260 at 15*d.*

Facit 78*l.* 15*s.*

1612 at 15*d*.¼

Facit 102*l*. 8*s*. 7*d*.

1210 at 15*d*.½

Facit 78*l*. 2*s*. 11*d*.

7612 at 15*d*.¾

Facit 499*l*. 10*s*. 9*d*.

6100 at 16*d*.

Facit 406*l*. 13*s*. 4*d*.

7121 at 16*d*.¼

Facit 482*l*. 3*s*. 0*d*.¼

1218 at 16*d*.½

Facit 83*l*. 14*s*. 9*d*.

8100 at 16*d*.¾

Facit 565*l*. 6*s*. 3*d*.

4128 at 17*d*.

Facit 292*l*. 8*s*.

1230 at 17*d*.¼

Facit 88*l*. 8*s*. 1*d*.½

2340 at 17*d*.½

Facit 170*l*. 12*s*. 6*d*.

3450 at 17*d*.¾

Facit 255*l*. 3*s*. 1*d*.½

4560 at 18*d*.

Facit 342*l*.

5670 at 18*d*.¼

Facit 431*l*. 3*s*. 1*d*.½

6789 at 18*d*.½

Facit 523*l*. 6*s*. 4*d*.½

7890 at 18*d*.¾

Facit 616*l*. 8*s*. 8*d*.½

8900 at 19*d*.

Facit 704*l*. 11*s*. 8*d*.

9000 at 19*d*.¼

Facit 721*l*. 17*s*. 6*d*.

9876 at 19*d*.½

Facit 802*l*. 8*s*. 6*d*.

8765 at 19*d*.¾

Facit 721*l*. 5*s*. 8*d*.¾

7120 at 20*d*.¼

Facit 600*l*. 15*s*.

6543 at 20*d*.½

Facit 558*l*. 17*s*. 7*d*.½

5432 at 20*d*.¾

Facit 469*l*. 12*s*. 10*d*.

4321 at 21*d.*

Facit 378*l.* 1*s.* 9*d.*

3210 at 21*d.*¼

Facit 384*l.* 4*s.* 4*d* ½

2100 at 21*d.*½

Facit 188*l.* 2*s.* 6*d.*

1000 at 21*d.*¾

Facit 90*l.* 12*s.* 6*d.*

1090 at 22*d.* †

Facit 99*l.* 18*s.* 4*d.*

9010 at 22*d.*¼

Facit 835*l.* 6*s.* 0*d.*½

6700 at 22*d.*½

Facit 628*l.* 2*s.* 6*d.*

6812 at 22*d.*¾

Facit 645*l.* 14*s.* 5*d.*

1210 at 23*d.*

Facit 115*l.* 19*s.* 2*d.*

1800 at 23*d.*¼

Facit 174*l.* 7*s.* 6*d.*

6760 at 23*d.*½

Facit 661*l.* 18*s.* 4*d.*

9990 at 23*d.*¾

Facit 988*l.* 11*s.* 10*d.*½

† Note, When the Price of an Integer is 22 d. annex a Cypher to the given Number, and divide by 12, (as at 10 d.) then add both lines together; the Sum will be the Total in Shillings.

CASE 4.

Q. *What muſt be done with the Price of an Integer, when it is any even Number of Shillings under* 20 s. *as* 6 s. 8 s. *&c.*

A. Multiply the given Quantity by half of the Price, and double the firſt Figure of the Product for Shillings, and the reſt of the Product will be Pounds.

Note, This Rule is taken from an Operation in Decimals.

EXAMPLES.

486 at 2*s.*
1

48*l.* 12*s.*

769 at 4*s.*
2

153*l.* 16*s.*

7612 at 2*s.*

Facit 761*l.* 4*s.*

1286 at 4*s.*

Facit 257*l.* 4*s.*

7618 at 6*s.*

Facit 2285*l.* 8*s.*

191 at 8*s.*

Facit 76*l.* 8*s.*

180 at 10*s.* †

Facit 90*l.*

171 at 14*s.*

Facit 119*l.* 14*s.*

171 at 16*s.*

Facit 136*l.* 16*s.*

712 at 18*s.*

Facit 640*l.* 16*s.*

† Note, When the Price of an Integer is 10 s. you may take half of the given Integers, and it is done; and the Remainder (if there be any) will be 10 s.

CASE 5.

Q. *What muſt be done with the Price of an Integer, when it is any odd Number of Shillings under* 20, *as* 3 s. 5 s. *&c.*

A. Multiply the given Integers by the Price, and that Product divide by 20, the Quotient will be the Anſwer.

EXAMPLES.

121 at 1*s.*

Facit 6*l.* 1*s.*

121 at 3*s.*

Facit 18*l.* 3*s.*

471 at 5*s.* *

Facit 117*l.* 15*s.*

860 at 7*s.*

Facit 301*l.*

612 at 9*s.*

Facit 275*l.* 8*s.*

121 at 11*s.*

Facit 66*l.* 11*s.*

600 at 1⅓*s.*

Facit 390*l.*

190 at 15*s.*

Facit 142*l.* 10*s.*

121 at 17*s.*

Facit 102*l.* 17*s.*

100 at 19*s.*

Facit 95*l.*

* Note, When the Price of an Integer is 5 s. the Work may be done at once, becauſe 5 s. is the fourth part of a Pound.

CASE 6.

Q. *What muſt be done with the Price of an Integer, when it is Shillings and Pence?*

A. 1. If the Shillings and Pence be the aliquot Part of a Pound, it may be done at once, as 6*s.* 8*d.* is the third of a Pound.

EXAMPLES.

12 at 6*s.* 8*d.*

Facit 4*l.*

69 at 3*s.* 4*d.*

Facit 11*l* 10*s.*

21 at 2*s.* 6*d.*

Facit 2*l.* 12*s.* 6*d.*

96 at 1*s.* 8*d.*

Facit 8*l.*

2. If the Shillings and Pence be not the aliquot Part of a Pound, or if there be Shillings, Pence, and Farthings, multiply the given Quantity by the Shillings and take Parts with the reſt, and add them together; the Sum will be the Anſwer in Shillings.

EXAMPLES.

3 | ¼ | 126 at 9*s.* 3*d.*

9

1134

2|0 31 6

116|5 6

58*l.* 5*s* 6*d.*

86 at 6*s.* 10*d.*

Facit 29*l.* 7*s* 8*d.*

10 at 12*s* 4*d*

Facit 6*l.* 3*s.* 4*d.*

30 at 4*s* 9*d.*

Facit 7*l.* 2*s* 6*d.*

73 at 7*s.* 6*d*

Facit 27*l.* 7*s*, 6*d.*

70 at 7*s.* 4*d* ¾

Facit 25*l.* 17*s.* 8*d* ½

55 at 4*s.* 8*d* ½

Facit 12*l.* 18*s.* 11*d* ½

77 at 10*s.* 6*d* ¼

Facit 40*l* 10*s.* 1*d.* ¼

12 at 13*s.* 10*d.* ½

Facit 8*l.* 6*s.* 6*d.*

17 at 17*s.* 4*d* ¼

Facit 14*l.* 15*s.* 0*d.* ¼

46 at 7*s.* 3*d* ¾

Facit 16*l.* 16*s.* 4*d.* ½

CASE 7.

Q. *What muſt be done with the Price of an Integer, when it is Pounds only?*

A. Multiply the given Integers by the Price, the Product will be the Anſwer.

EXAMPLES.

72 at 5*l.*	19 at 4*l.*
Facit 360*l.*	*Facit* 76*l.*
64 at 3*l.*	46 at 7*l.*
Facit 192*l.*	*Facit* 322*l.*

CASE 8.

Q. *What muſt be done with the Price of an Integer, when it is Pounds and Shillings?*

A. Multiply the Integers given by the Pounds; then proceed with the Shillings, if they are even, according to Caſe 4; but if they are odd, according to Caſe 5, and add them together; the Total will be the Anſwer.

EXAMPLES.

26 at 4*l.* 8*s.*	48 at 7*l.* 10*s.*
4	
	Facit 360*l.*
104	
10 8	26 at 11*l.* 14*s.*
114*l.* 8*s.*	
	Facit 304*l.* 4*s.*
49 at 3*l.* 7*s.*	
7	15 at 4*l.* 13*s.*
2|0 34|3	*Facit* 69*l.* 15*s.*
17 3	17 at 9*l.* 15*s.*
147	
164*l.* 3*s.*	*Facit* 165*l.* 15*s.*
36 at 5*l.* 13*s.*	16 at 3*l* 6*s.*
Facit 203*l.* 8*s.*	*Facit* 52*l.* 16*s.*

CASE 9.

Q. *What muſt be done with the Price of an Integer, when it is Pounds, Shillings, and Pence?*

A. 1. If the Shillings and Pence be the aliquot Part of a Pound, multiply the given Integers by the Pounds, and divide by the aliquot Part: Thoſe Numbers ſo found out, being added together, will be the Sum required.

EXAMPLES.

47 at 3*l.* 3*s.* 4*d.*

Facit 148*l.* 16*s.* 8*d.*

20 at 4*l.* 13*s.* 4*d*

Facit 93*l.* 6*s* 8*d.*

17 at 2*l.* 6*s.* 8*d.*

Facit 39*l.* 13*s.* 4*d.*

30 at 1*l.* 2*s.* 6*d.*

Facit 33*l.* 15*s.*

2. If the Shillings and Pence be not the aliquot Part of a Pound, or if there be Shillings, Pence and Farthings given with the Pounds, then reduce the Pounds and Shillings into ſhillings, and multiply the given Integers by the ſaid Shillings; next take parts with the reſt of the price, and add them together as before.

EXAMPLES.

3 | ¼ | 120 at 4*l* 7*s.* 3*d.*½
87 20
10440 87
30
½ | ⅙ | 5
1047|5
2|0 523*l* 15*s.*

14 at 2*l* 10*s.* 6*d.*

Facit 35*l.* 7*s.*

21 at 5*l.* 14*s.* 7*d.*¼

Facit 120*l.* 6*s.* 8*d.*¼

70 at 1*l.* 14*s.* 7*d.*

Facit 121*l.* 0*s.* 10*d.*

46 at 3*l.* 19*s.* 8*d.*½.

Facit 183*l.* 6*s.* 7*d.*

Q. *What other ways have you of anſwering Queſtions in this Caſe?*

A. 1. When the Number of Integers does not exceed 12, multiply the Price by the Integers, as in Compound Multiplication, the Product will be the Anſwer.

2. When the Number of Integers does exceed 12, multiply the Price by the Parts inſtead of the whole. Or,

3. You may multiply the Price by the whole Number of Integers. Thus,

58361 *hhds.* of Tobacco, at 48*l*, 12*s*. 9*d* *per hhd.*

			Memorandum.							
			1.		2.		3.		4.	
l.	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
48	12	9								
	58361									
48	12	9	16	6						
2918	5	0	18	3	2	6				
14591	5	0	2	0						
389100	0	0	3	9	17	6	15	0	10	0
2431875	0	0								
2838533	2	9								

Q. *How is it wrought?*

A. Multiply by the ſeveral Figures in the Multiplier, as in Compound Multiplication, but with this Difference, that the Products of the Shillings and Pence, multiplied by the 6, 3, 8, and 5, muſt be placed by themſelves in a Memorandum, and the Products of the Pounds by the ſame Figures, placed as in Simple Multiplication. Thus,

	l.	*s.*	*d.*	*Memor.*	
	48	12	9		
		58361			
1 Product —	48	12	9	*s.*	*d.*
2 — —	291			16	6
3 — —	145			18	3
4 —	389			2	0
5 —	234			3	9

Then to fill up the Blanks in the ſecond product, take half of the 16*s*. in the Memorandum, which is 8, and ſet it in the Units place of the Pounds. Annex a Cypher to the 6*d* which makes 60*d* or 5*s*. place this under the Shillings, and the Line is done with, there being no Pence remaining.

For the Blanks in the third Product, take half of the 18*s*. in the Memorandum, and put it in the Tens place of the pounds. Annex a Cypher to the 3*d*. which makes 30*d*. or 2*s*. 6*d*. this put in the ſecond Memorandum. Then take half of the 2*s*. in this new Memorandum, and put it in the Units Place of the Pounds. Annex a Cypher to the 6*d*. in the new Memorandum, which makes 60*d*. or 5*s*. put this in the place of Shillings, and this Line is finiſhed, there being no Pence remaining.

For the Blank in the fourth product, take half of the 2*s.* in the firſt Memorandum, and put it in the Hundreds place of the Pounds: and becauſe there remains nothing, nor are there any Pence in the Memorandum, therefore fill up the other Blanks with Cyphers, and the Line is finiſhed,

For the Blanks in the fifth product, take half of the 3*s.* in the firſt Memorandum, and put it in the thouſands place of the pounds; then, becauſe there is one remaining, put that in the ſecond Memorandum. Annex a Cypher to the 9*d.* which makes 90*d.* or 7 *s.* 6 *d.* put this to the former 1, and it makes 17*s.* 6*d.* take half of the 17 *s.* and put it in the Hundreds Place of the Pounds; then, becauſe there is 1 remaining, put that in the third Memorandum. Annex a Cypher to the 6 *d.* and it makes 60*d* or 5*s.* put this to the 1 in the third Memorandum, and it makes 15*s.* take half of the 15*s* and put it in the Tens Place of the Pounds; then, becauſe there remains 1, put it in the fourth Memorandum, and ſince there are no Pence in the third Memorandum to put a Cypher to, let a cypher be annexed to the 1 in the laſt Memorandum, which makes 10 *s.* take half of this 10*s.* and put it in the Units place of the Pounds; then becauſe there are no Pence in the Memorandum, neither is there any thing remaining of the 10, therefore fill up the other Blanks with Cyphers, and the Line is compleated: Add all together, and there Sum is the Total Product of the whole.

	l.	*s.*	*d.*	*Memorandum.*		
7000 *hhds.* of Wine, at	17	14	8 *per hhd.*	1.	2.	3.
			7000	*s.* *d.*	*s.* *d.*	*s.* *d.*
				2 8	6 8	6 8
	124133	6	8			

Note 1. To fill up the Blanks in the Pounds of the Second, Third, &c. Products, always take half of the Shillings in the Memorandum; and if 1 remains, make a new Memorandum of it.

2. Always annex a Cypher to the Pence, and whatever Number of Shillings they make, put them to the 1 in the new Memorandum, and ſo on till all the Blanks in the Pounds are filled up: If there be any Pence yet remaining in the Memorandum, put a Cypher to them, and what Shillings and Pence they make, let them be put in the Shillings and Pence Place in the Product.

3. All the Examples in this Caſe, and Caſe 8, may ſerve here, inſtead of others.

CASE 10.

Q. *What muſt be done with the Price of an Integer, when both that and the Quantity given are of ſeveral Denominations?*

A. Multiply the Price by the Integers, and take Parts with the Parts of the Integer.

EX-

EXAMPLES.

C.	*qrs.*	*lb.*		*l.*	*s.*			*l.*	*s.*	*d.*
12	3	16	of Tobacco, at	4	12	*per C. wt.*	*Facit*	59	6	1½+

		l.	*s.*	*d.*
½	½		12	
		55	4	
¼	½	2	6	
16	⅐	1	3	
		0	13	1½+
		59	6	1½+

C.	*qrs.*	*lb.*			*l.*	*s.*	*d.*			*l.*	*s.*	*d.*
12	2	14	of Tobacco,	at	3	14	0	*per C.*	*Facit*	46	14	3
17	3	19	of Sugar,	at	2	2	6	*per C.*	*Facit*	38	1	6¼
4	1	16	of Soap,	at	3	12	0	*per C.*	*Facit*	15	16	3½
10	0	12	of Tallow,	at	1	19	6	*per C.*	*Facit*	19	19	2½
5	1	0	of Tobacco,	at	2	17	0	*per C.*	*Facit*	14	19	3
4	3	0	of Sugar,	at	2	18	6	*per C.*	*Facit*	13	17	10½
7	0	19	of Sugar,	at	3	16	0	*per C.*	*Facit*	27	4	10½
5	2	10	of Tobacco,	at	2	18	6½	*per C.*	*Facit*	16	7	2¼
7	1	14	of Tobacco,	at	3	15	9¼	*per C.*	*Facit*	27	18	9¾
9	2	26	of Tallow,	at	4	10	4½	*per C.*	*Facit*	43	19	6

Of INTEREST.

Q. HOW *many kinds of Intereſt are there?*

A. Two: Simple and Compound.

Of Simple INTEREST.

Q. *What is Simple Intereſt?*

A. Simple Intereſt is the Profit allowed in the lending or forbearance of any Sum of Money, for ſome determined Space of Time.

Q. *What is the Principal?*

A. The Principal is any Sum of Money lent, for which Intereſt is to be received.

Q. *What is the Rate per Cent?*

A. It is a certain Sum agreed on between the Lender and the Borrower, to be paid for every 100 Pounds, for the uſe of the Principal, which, according to the Laws of England, ought not to be above 5 *l.* for the uſe of 100 *l.* for one Year, and 10 *l.* for the uſe of 100 *l.* for two Years; and ſo on for any Sum of Money, in proportion to the time propoſed.

Q. *What is the Amount?*

A. It is the Principal and Intereſt added together.

Q. *What other Things is Intereſt applicable to?*

A. It is applied to Commiſſion or Proviſion, Brokage, Storage, and Inſurance, which have no reſpect to Time.

CASE 1.

Q. *How do you find the Intereſt of any given Sum for a Year?*

A. Multiply the Principal by the Rate *per cent* and divide that Product by 100, the Quotient is the Intereſt required.

Q. *How do you find the Intereſt of any given Sum for ſeveral Years?*

A. Multiply the Intereſt for one Year by the Number of Years given in the Queſtion: the product will be the Anſwer.

EXAMPLES.

1. If 100 *l.* in one Year's time yield 5 *l.* Intereſt, what will 486 *l.* yield in the ſame time? *Anſw.* 24 *l.* 6 *s.*

```
    l.
   486
     5
  ----
  24|30
    |20
    |--
   6|00
```

2. What is the Intereſt of 220 *l.* for a Year, at 4 *per cent. per ann*? *Anſw.* 8 *l.* 16 *s.*

3. What is the Intereſt of 76 *l.* for 2 Years, at 5 *per cent. per ann*? *Anſw.* 7 *l.* 12 *s.*

4. What is the Amount of 400 *l.* for 12 Years, at 6 *per cent. per ann.*? *Anſw.* 688 *l.*

Of Factors Allowances, commonly called Commiſſion *or* Proviſion.

Q. *What is Commiſſion or Proviſion?*

A. It is an Allowance from Merchants to their Factors or Agents beyond the Sea, in the buying or ſelling of any ſort of Goods: and is a certain Rate *per cent.* according to the Cuſtom of the Country where the Factor reſides.

EXAMPLES.

5. My Factor ſends me word, that he has bought Goods to the Value of 500 *l.* 13 *s.* 6 *d* upon my Account; I demand what his Commiſſion comes to, at 3½ *per cent*? *Anſw.* 17 *l.* 10 *s.* 5 *d.* 2 *qrs* $\frac{68}{100}$.

6. My Correſpondent has diſburſed upon my Account the Sum of 1009 *l.* 18 *s.* what muſt he demand for his Commiſſion, when I allow him 2¼ *per cent?* *Anſw.* 22 *l.* 14 *s.* 5 *d.* 1 *qr.* $\frac{84}{100}$

7. Suppoſe I allow my Correſpondent 1¾ *per cent.* for Proviſion; what may he demand on the Diſburſement of 704 *l.* 15 *s.* 4 *d.*? *Anſw.* 12 *l.* 6 *s.* 8 *d.* $\frac{2}{100}$.

CASE 2.

Q. *How do you find the Intereſt of any Sum, for ¼ ½, or ¾ of a Year, beſides the Number of Years given in the Queſtion?*

A. For ¼ of a Year, take a fourth part of the Intereſt for one Year; for ½ a Year, take half of the Intereſt for one Year; for ¾ of a Year, take the parts compounded of ¾ and add them to the Intereſt for the reſt of the time; the Sum will be the Intereſt required

EXAMPLES.

1. What is the Intereſt of 200 *l* for 3 Years and ¾, at 5 *per cent. per annum?* *Anſw.* 37 *l.* 10 *s.*

```
    200          | ½ | ½ | 10
      5          |   |   |  3
  ------         |   |   | --
   1 0|0 0       |   |   | 30
                 | ¼ | ½ |  5
                 |   |   |  2   10
                          ---------
                           37   10
```

2. What is the Intereſt of 468 *l* 12 *s.* 4 *d.* for 1 Year and ¾, at 6 *per cent. per annum?* *Anſw.* 49 *l* 4 *s* 1 *d*

3. What is the Intereſt of 112 *l.* 10 *s.* 4 *d* for 5 Years and ½, at 6 *per cent per annum?* *Anſw* 37 *l* 2 *s.* 6 *d* +

4. What is the Intereſt of 468 *l.* for 4 Years and ¾, at 6 *per cent. per annum?* *Anſw* 119 *l.* 6 *s.* 8 *d* ¾

5. What is the Intereſt of 1000 *l.* for 2 Years ¾, at 4 *per cent. per annum?* *Anſw.* 110 *l*

Of BROKAGE.

Q. *What is Brokage?*

A. It is an Allowance made to perſons called Brokers, at a certain Rate *per cent* for finding Cuſtomers, and ſelling to them the Goods of other Men, whether Strangers or Natives.

Q *How do you find the Brokage of any Sum?*

A. Divide the given Sum by 100, and take parts from the Quotient with the Rate *per cent.*

EX.

EXAMPLES.

6. What is the Brokage of 700*l.* 14*s.* 6*d.* at 4*s.* *per cent*? *Anſw.* 1*l.* 8*s.* 0*d.*¼

```
  l.  s.  d.                      l.  s.  d.
 7,00 14  6          | 4 | 1/5 | 7   0   1½
   |20                          ------------
   |—                           | 1   8   0¼X
  0|14
   |12
   |—
  1|74
   | 4
   |—
  2|96
```

7. What may a Broker demand for Brokage, when he ſells Goods to the value of 500*l.* 10*s.* 7*d.* and I allow him 7*s* *per cent*? *Anſw.* 1*l.* 15*s.* 0*d.*¼.

8. Suppoſe I employ a Broker, who ſells Goods to the value of 909*l.* 14*s.* 10*d.* what is the Brokage at 6*s.* 6*d.* *per cent*? *Anſw.* 2*l.* 19*s.* 1*d.*¼.

Note, *If the Brokage ſhould be* 1*l.* *or more per Cent. the Operation will be the ſame with that in Factors allowances.*

CASE 3.

Q. *How is the Intereſt of any Sum found when the Rate* per Cent. *is* ¼, ½, *or* ¾ *more than the Pounds given in the ſaid Rate?*

A. Multiply the Principal by the Pounds, in the Rate *per Cent.* as before; and let the parts for ¼, ½, or ¾, be taken from the Principal, and added to that Product; then proceed according to Caſe 1. or 2.

EXAMPLES.

1. What is the Intereſt of 400*l.* for 2 Years, at 5½ *per cent. per annum*? *Anſw.* 44*l.*

2. What is the Intereſt of 120*l.* for a Year, at 4½ *per cent. per annum*? *Anſw.* 5*l.* 8*s.*

3. What is the Amount of 690*l.* for 3 Years, at 4¼ *per cent. per annum*? *Anſw.* 777*l.* 19*s.* 6*d.*

4. What is the Amount of 120*l.* 10*s.* for 2 Years and an half, at 4¾ *per cent. per annum*? *Anſw.* 134*l.* 16*s.* 1*d.*¾

5. What is the Intereſt of 300*l.* for 5 Years and 3 Quarters, at 3¾ *per cent. per annum*? *Anſw.* 64*l.* 13*s.* 9*d.*

CASE 4.

Q. *How do you find the Intereſt of any Sum, for a certain Number of Weeks?*

A. As 52 Weeks
Are to the Intereſt of the given Sum for a Year:
So are the Weeks given,
To the Intereſt required.

EXAMPLES.

1. What is the Intereſt of 400 *l.* for a Week, at 5 *per cent. per annum*? *Anſw.* 7 *s.* 8 *d.* 1 *qr.* $\frac{12}{52}$.

2. What is the Intereſt of 126 *l.* 12 *s.* for 16 Weeks, at 4½ *per cent. per annum*? *Anſw.* 1 *l.* 15 *s.* 0 *d.* 2 *qrs.* $\frac{40}{52}$.

3. What is the amount of 500 *l.* for 20 Weeks, at 3½ *per cent. per annum*? *Anſw.* 506 *l.* 14 *s.* 7 *d.* 1 *qr.* $\frac{28}{52}$.

CASE 5.

Q. *How is the Principal found when the Amount, Time, and Rate per cent. are given?*

A. As the Amount of 100 *l.* at the Rate and Time given
Is to 100 *l*:
So is the Amount given,
To the Principal required.

EXAMPLES.

1. What Principal being put to Intereſt for 9 Years, at 5 *per cent. per annum*, will amount to 725 *l.*? *Anſw.* 500 *l.*

2. What Principal being put to Intereſt for 7 Years, will amount to 793 *l.* 12 *s.* at 4 *per cent. per annum*? *Anſw.* 620 *l.*

3. What Sum being put to Intereſt, will amount to 520 *l.* 16 *s.* in 8 Years, at 3 *per cent. per annum*? *Anſw.* 420 *l.*

CASE 6.

Q. *How is the Rate per Cent. found, when the Amount, Time and Principal are given?*

A. 1. As the Principal
Is to the Intereſt for the whole Time:
So is 100 *l.*
To its Intereſt for the ſame Time.

2. Divide the Intereſt laſt found, by the Time, and the Quotient will be the Rate *per cent.*

EXAMPLES.

1. At what Rate of Intereſt *per Cent.* will 500 *l.* amount to 725 *l.* in 9 Years time? *Anſw* 5 *per cent.*

2. At what Rate of Intereſt *per cent.* will 620 *l.* amount to 793 *l.* 12 *s.* in 7 Years? *Anſw.* 4 *per cent.*

3. At what Rate of Intereſt *per cent.* will 420 *l.* amount to 520 *l.* 16 *s.* in 8 Years? *Anſw.* 3 *per cent.*

CASE 7.

Q. *How is the Time found when the Principal, Amount, and Rate per cent. are given?*

A. As the Intereſt of the Principal for 1 year at the given rate
Is to one Year:
So is the whole Intereſt,
To the Time required.

EXAMPLES.

1. In what time will 500 *l.* amount to 725 *l.* at 5 *per cent. per annum?* *Anſw.* 9 *years.*

2. In what time will 620 *l.* amount to 793 *l.* 12 *s.* at 4 *per cent. per annum?* *Anſw.* 7 *years.*

3. In what time will 420 *l.* amount to 520 *l.* 16 *s.* at 3 *per cent. per annum?* *Anſw.* 8 *years.*

Q. *How are the Queſtions in the foregoing Caſes proved?*

A. Caſes 1, 5, 6 and 7 do exactly prove each other, by varying the Queſtions: yet all of them except Caſe 5, and the 1ſt, 2d, 5th, 6th, and 7th Queſtions in Caſe 1; and the 6th 7th, and 8th, in Caſe 2, may as truly be anſwered by the Double Rule of Three, of which more hereafter.

Note 1. The 1ſt, 2d, 5th, 6th, and 7th Queſtions in Caſe 1; and the 6th, 7th, and 8th, in Caſe 2, are to be proved by the Single Rule of Three.

2. Caſe 5th, cannot be anſwered by the Double Rule of Three, becauſe the principal is not known in the Queſtion, and therefore there can be no Deduction of it from the Amount, to know the Intereſt, which muſt firſt be done.

Of Simple Intereſt *for* Days.

Q. *How do you find the Intereſt for any Number of Days?*

A. Multiply the Pence of the Principal by the Days, and by the Rate of Intereſt for a Dividend, and 365 by 100 for a Diviſor, the Quotient will be the Anſwer in Pence.

Q. *How are the following Queſtions proved?*

A. As 365 Days
Are to the Intereſt of the given Sum for a Year:
So is the Time propoſed,
To the Intereſt required.

EXAMPLES.

1. What is the Intereſt of 120 *l.* for 126 Days, at 4 *per cent. per annum?* *Anſw.* 1 *l.* 13 *s.* 1 *d.* 2 *qrs.* $\frac{258}{365}$.

2. What is the Intereſt of 126 *l.* for 145 Days, at 6 *per cent. per annum?* *Anſw.* 3 *l.* 0 *s.* 0 *d.* 3 *qrs.* $\frac{57}{365}$.

3. What is the Intereſt of 100 *l.* from June 1, 1763, to March 9, 1764, which was Leap-year, at 5 *per cent. per annum*? *Anſw.* 3 *l.* 17 *s.* 6 *d.* 1 *qr.* $\frac{235}{365}$.

4. What is the Intereſt of 200 *l.* from Auguſt 14, to December 19 following, at 6 *per cent. per annum*? *Anſw.* 4 *l.* 4 *s.* 1 *d.* 3 *qrs.* $\frac{325}{365}$.

5. What is the Intereſt of 10 *l.* for 25 Days, at 5 *per cent. per annum*? *Anſw.* 8 *d.* $\frac{80}{365}$.

6. What is the Intereſt of 40 *l.* for 40 Days, at 4 *per cent. per annum*? *Anſw.* 3 *s.* 6 *d.* $\frac{30}{365}$.

See more of Simple Intereſt in Decimals.

Of Compound INTEREST.

Q. *What is Compound Intereſt?*

A. Compound Intereſt is that which ariſes from any Principal and its Intereſt put together, as the Intereſt ſtill becomes due; and for that reaſon it is called Intereſt upon Intereſt, or Compound Intereſt.

Q. *Is it lawful to let out Money at Compound Intereſt?*

A. No: yet in purchaſing of Annuities or Penſions, and Leaſes in Reverſion, it is very uſual to allow Compound Intereſt to the Purchaſer for his ready Money; and therefore it is very neceſſary to underſtand it.

Q. *How do you find the Compound Intereſt of any given Sum for any number of Years?*

A. 1. Find the Amount of the given Sum by Simple Intereſt for the firſt Year, which is the Principal for the ſecond Year, then find the Amount of that Principal for the ſecond Year, and that is the Principal for the third Year; and ſo on for any Number of Years given.

2. Subtract the given Sum from the laſt Amount, and the Remainder is the Compound Intereſt required.

EXAMPLES.

1. What Sum will 450 *l.* amount to in 3 Years, at 5 *per cent. per annum*, Compound Intereſt? *Anſw.* 520 *l.* 18 *s.* 7 *d.* ½

2. What will 400 *l.* amount to in 4 years, at 6 *per cent. per annum*, Compound Intereſt? *Anſw.* 504 *l.* 19 *s.* 9 *d.* ¼

3. What will 480 *l.* amount to in 6 Years, at 5 *per cent. per annum*, Compound Intereſt? *Anſw.* 643 *l.* 4 *s.* 10 *d.* ½

4. What will 500 *l.* amount to in 4 Years, at 4¼ *per cent. per annum*, compound Intereſt? *Anſw.* 590 *l.* 11 *s.* 5 *d.* ½

5. What is the Compound Intereſt of 400 *l.* 10 *s.* at 3½ *per cent. per annum*, for 3 Years? *Anſw.* 43 *l.* 10 *s.* 9 *d.* ½.

Note, See more of Compound Intereſt in Decimals.

Of REBATE *or* DISCOUNT.

Q. W*HAT is Rebate or Diſcount?*

A. Rebate or Diſcount is when a Sum of Money due at any time to come, is ſatisfied by paying ſo much preſent Money, as being put out to Intereſt, would amount to the given Sum in the ſame Space of time.

Q. *How is the Operation perform'd?*

A. 1. As 12 Months
Are to the Rate *per Cent.*
So is the Time propoſed
To a fourth Number.
2. Add that fourth Number to 100 *l.*
3. As that Sum
Is to the fourth Number:
So is the given Sum
To the Rebate.
4. Subtract the Rebate from the given Sum, and the Remainder is the preſent Worth. Or thus,
3. As that Sum
Is to 100 *l.*
So is the given Sum
To the preſent Payment.
4. Subtract the preſent Payment from the given Sum, and the Remainder is the Rebate.

Q. *How do you prove Queſtions in Rebate?*

A. Find the amount of the preſent Payment at the Time and Rate *per cent.* given, and that will be equal to the given Sum.

EXAMPLES.

1. What is the Rebate of 795 *l.* 11 *s.* 2 *d.* for 11 Months, at 6 *per cent*? *Anſw.* 41 *l.* 9 *s.* 5 *d.* 3 *qrs.* $\frac{1572}{2532}$.

2. What is the preſent worth of 161 *l.* 10 *s.* for 19 Months, at 5 *per cent*? *Anſw.* 149 *l.* 13 *s.* 0 *d.* $\frac{3}{4}$

3. Sold Goods for 795 *l.* 11 *s.* 2 *d.* to be paid 4 Months hence, what is the preſent worth, at $3\frac{1}{2}$ *per cent*? *Anſw.* 786 *l.* 7 *s.* 8 *d.* $\frac{1}{4}$

4. What is the preſent worth of 4000 *l.* payable in 9 Months, at $4\frac{3}{4}$ *per cent*? *Anſw* 3862 *l.* 8 *s.* 0 *d.* $\frac{1}{2}$

5. How much ready Money for a Note of 18 *l.* due 15 Months hence, at 5 *per cent*? *Anſw.* 16 *l.* 18 *s.* 10 *d.*

6. Suppoſe 810 *l.* were to be paid 3 Months hence, allowing 5 *per cent.* diſcount, what muſt be paid in hand? *Anſw.* 800 *l.*

7. If a Legacy of 1000*l.* is left me July 24, 1763, to be paid on the Chriſtmas-day following; what muſt I receive, when I allow 6 *per cent.* for preſent Payment? *Anſw.* 974 *l.* 3 *s.* 1 *d.*

8. Being obliged by a Bond bearing date Auguſt 29, 1763, to pay next midſummer, (which is Leap-Year) 326 *l.* what muſt I pay down, if they allow Diſcount after the Rate of 8 *per cent*? *Anſw.* 305 *l.* 16 *s.* 6 *d.* $\frac{1}{4}$

9. Sold Goods for 312 *l.* to be paid at two three Months, (that is, half at 3 Months, and the other half at 3 Months after that) what muſt be diſcounted for the preſent Payment, at 5 *per cent*? *Anſw.* 5 *l.* 14 *s.* 7 *d.*

10. Sold Goods for 300 *l.* to be paid at three two Months, (that is, one third at 2 Months, one third at 4 Months, and one third at 6 Months) what muſt be diſcounted for preſent Payment, at 4 *per cent*? *Anſw.* 3 *l.* 18 *s* 9 *d.*

11. What is the preſent worth of 100 *l.* at 5 *per cent.* payable at two four Months? *Anſw.* 97 *l.* 11 *s* 4 *d* $\frac{1}{2}$

12. I would know the preſent worth of 150*l.* payable at three four Months, at 5 *per cent.* Diſcount? *Anſw.* 145 *l.* 3 *s.* 9*d.*$\frac{1}{4}$.

13. What is the preſent worth of 200 *l.* at 4 *per cent.* payable as follows, *viz.* 100 *l.* at 2 Months; 50 *l.* at 3 Months; and 50 *l.* at 5 Months? *Anſw.* 198 *l.* 0 *s.* 6 *d.*

Of EQUATION *of* PAYMENTS.

The common Way.

Q. WHAT *is Equation of Payments?*

A. When ſeveral Sums of Money, to be paid at different times, are reduced to one mean time for the Payment of the whole, without Loſs to Debtor or Creditor, this is called Equation of Payments.

Q. *Wherein may the Debtor or Creditor be ſaid to ſuffer loſs, when the Debt is paid?*

A. 1. When one mean Time is aſſigned for the Payment of the whole Debt, and the Money is not paid till ſome time afterwards; then the Debtor ſuffers loſs, by paying not only the Principal, or Sum due, but alſo the Intereſt of that Sum for the time of Forbearance, at 3, 4, or more *per cent.* as they ſhall agree. Likewiſe, if the Money be paid before it is due, then the Creditor ſuffers loſs by allowing ſo much *per cent.* by Agreement, for the time of Prompt Payment.

2. The loſs to either party, may be in reducing the ſeveral times of Payment to one, which is not the true equated Time; and then if the Payment be made after the true Time, the Creditor ſuffers loſs, becauſe he receives no Intereſt for it: If the time agreed on be before the true time, then the Debtor ſuffers loſs, becauſe he receives no Intereſt for his early Payment.

Q. *How is the Operation wrought?*

A. Multiply each Payment by its Time, and divide the Sum of all the Products by the whole Debt, the Quotient is the equated Time.

EXAMPLES.

1. A owes B 100 *l.* whereof 50 *l.* is to be paid at 2 Months, and 50 *l.* at 4 Months; but they agree to reduce them to one Payment; when muſt the whole be paid? *Anſw.* 3 *Months.*

2. A Merchant hath owing him 300 *l.* to be paid as follows: 50 *l.* at 2 Months, 100 *l.* at 5 Months, and the reſt at 8 Months; and it is agreed to make one Payment of the whole; I demand when that time muſt be? *Anſw.* 6 *Months.*

3. F owes to H 1000 *l.* whereof 200 *l.* is to be paid preſent, 400 *l.* at 5 Months, and the reſt at 10 Months, but they agree to make one Payment of the whole; I demand the equated time? *Anſw.* 6 *Months.*

4. K is indebted to L a certain Sum, which is to be diſcharged at 4 ſeveral Payments, that is ¼ at 2 Months, ¼ at 4 Months, ¼ at 6 Months, and ¼ at 8 Months; but they agreeing to make but one Payment of the whole, the equated time is therefore demanded? *Anſw.* 5 *Months.*

5. H bought of X a quantity of Goods upon truſt, for which H was to pay ⅓ of the Debt every 3 Months, till the whole was diſcharged; but they afterwards agreed to pay the whole at one equated time; the time is demanded? *Anſ.* 6 *Months.*

6. W owes Z a Sum of Money, which is to be paid ½ preſent, ¼ at 4 Months, and the reſt at 8 Months, what is the equated time for the whole? *Anſw.* 3 *Months.*

7. P owes Q 420 *l.* which will be due 6 Months hence; but P is willing to pay him 60 *l.* now, provided he can have the reſt forborne a longer time: It is agreed on; the time of Forbearance therefore is required? *Anſw.* 7 *Months.*

Note, This Queſtion is in Reverſe Proportion. See more of this Rule in Decimals.

Of

Of BARTER.

Q. W*HAT is Barter?*

A. Barter is the exchanging of one Commodity for another, and informs Merchants ſo to proportion their Quantities, as that neither may ſuſtain Loſs.

Q. *How do you prove Queſtions in Barter?*

A. By changing the Order of them.

EXAMPLES.

1. How much Sugar, at 9 *d. per lb.* muſt be given in Barter for 6 *C.*$\frac{1}{2}$ of Tobacco, at 14 *d. per lb*? *Anſ.* 10 *C.* 0 *qrs.* 12 *lb.*$\frac{4}{9}$.

2. What quantity of Tea, at 10 *s. per lb.* muſt be given in Barter for 1 *C.* of Chocolate, at 4 *s. per lb*? *Anſ.* 44 *lb.* 12 *oz.*$\frac{8}{10}$

3. How muſt Rice at 28 *s. per C. wt.* muſt be bartered for 3 *C.*$\frac{1}{2}$ of Raiſins, at 5 *d. per lb*? *Anſw.* 5 *C.* 3 *qrs.* 9 *lb.*$\frac{112}{336}$

4. A and B bartered: A had 5 *C.* of Sugar, at 6 *d. per lb.* which he gave to B for a quantity of Cinnamon, at 10 *s.* 8 *d. per lb.* I demand how much Cinnamon B gave A? *Anſw.* 26 *lb.* 4 *oz.*

5. B delivered 3 *hhds.* of Brandy, at 6 *s.* 8 *d. per* Gallon to C for 126 Yards of Cloth: what was the Cloth *per* Yard? *Anſw.* 10 *s.*

6. A and B bartered: A had 12 *C.* of Sugar, worth 4 *d. per lb.* for which B gave him 1 *C.*$\frac{3}{4}$ of Cinnamon; I demand how B rated his Cinnamon *per lb*? *Anſw.* 27 *d.*$\frac{84}{196}$

7. A hath Linen Cloth worth 20 *d.* an Ell ready Money; but in Barter he will have 2 *s.* B hath Broad Cloth worth 14 *s.* 6 *d. per* Yard ready Money; at what Price ought the Broad Cloth to be rated in Barter? *Anſw.* 17 *s.* 4 *d.* 3 *qrs.*$\frac{4}{20}$ *per yard.*

8. A and B bartered: A had 41 *C. wt.* of Hops, at 30 *s. per C.* for which B gave him 20 *l.* in Money, and the reſt in Prunes, at 5 *d. per lb.* I demand how many Prunes B gave A beſides the 20 *l*? *Anſw.* 17 *C.* 3 *qrs.* 4 *lb.*

9. C hath Candles at 6 *s. per* Dozen ready Money; but in Barter he will have 6 *s.* 6 *d. per* Dozen; D hath Cotton at 9 *d. per lb.* ready Money; I demand what Price the Cotton muſt be at in Barter; alſo how much Cotton muſt be bartered for 100 Dozen of Candles? *Anſw. The Cotton is* 9 *d.* 3 *qrs. per lb. in Barter; and* 7 *C.* 0 *qrs.* 16 *lb. of Cotton muſt be given for* 100 *Dozen of Candles.*

Of LOSS *and* GAIN.

Q. W*HAT is Loſs and Gain?*

A. Loſs and Gain is a Rule which teacheth Merchants what they ſhall gain or loſs in the ſale of their Goods, having the price that they bought them for, and the price for which they are to be ſold, both known.

Q. *How are the following Queſtions proved?*

A. Let them be varied.

EXAMPLES.

1. Bought 18 *C.* of Cheeſe, at 28*s per C.* which I ſell out again at 3*d.*$\frac{1}{2}$ *per lb.* what is the profit in the whole? *Anſw.* 4 *l.* 4 *s.*

2. If I buy Deals in, at 20 *d.* a-piece, and ſell them again at 17 *d.* what ſhall I loſe by 120 Dozen? *Anſw.* 18 *l.*

3. Hats bought at 4 *s.* a-piece, and ſold again at 4 *s.* 9 *d.* what is the profit in laying out 100 *l.*? *Anſw.* 18 *l.* 15 *s.*

4. Bought 19 Fother of Lead, at 14 *s per C.* what is gained by the whole, ſold out at 4 *d per lb*? *Anſw.* 432 *l.* 5 *s.*

5. Bought 60 Reams of Paper, at 15 *s per* Ream, what is the loſs in the whole Quantity, at 4 *per cent*? *Anſw.* 1 *l.* 16 *s.*

6. Bought 7 Tons of Wine, at 17 *l. per hhd* which I ſell again, at 1 *s. per* Pint; I demand the whole gain, and the gain *per cent*? *Anſw.* 229 *l.* 12 *s. whole gain;* and 48 *l.* 4 *s.* 8 *d.* 1 *qr* $\frac{420}{478}$ *the gain per cent.*

7. If I ſell 500 Deals at 15 *d* a-piece, and 9 *l. per cent.* loſs; what do I loſe in the whole quantity? *Anſw.* 2 *l* 16 *s.* 3 *d.*

8. Bought 3 Oxen for 24 *l.* 10 *s.* which I ſell again for 2 *s. per* Stone, what ought the 3 Oxen to weigh together, the Hides and Offal being the only clear Gain? *Anſw.* 245 *Stone.*

9. A Draper bought 100 Yards of Broad Cloth, for which he gave 56 *l.* I deſire to know how he muſt ſell it *per* Yard, to gain 19 *l.* in the whole? *Anſw.* 15 *s per Yard.*

10. A Draper bought 100 Yards of Broad Cloth for 56 *l.* I demand how he muſt ſell it *per* Yard, to gain 15 *l.* in laying out 100 *l*? *Anſw.* 12 *s.* 10 *d* 2 *qrs.* $\frac{24}{100}$.

Of FELLOWSHIP.

Q. H*OW many ſorts of Fellowſhip are there?*

A. Two: Single and Compound.

Of SINGLE FELLOWSHIP.

Q. *What is Single Fellowſhip?*

A. Single Fellowſhip is when the Stocks of each Partner continue for an equal Term of Time.

Q. *What is the Rule?*

A. As the Sum of the ſeveral Stocks,
Is to the Total Gain or Loſs:
So is each Man's Share in Stock,
To his Share of the Gain or Loſs.

Q. *How is this Rule proved?*

A. Add all the Shares together, and the Sum will be equal to the given Gain or Loſs.

Note, This way of proving Fellowſhip will not hold good always: For if an Error ſhould be committed in the beginning of the Work and carried on thro' the whole Operation, yet the ſame will prove, tho' each Man's Share of the Gain or Loſs aſſigned him by that Operation, be either more or leſs than his true Share. The moſt exact Method, then, that I would propoſe, tho' ſomething more tedious, is to change the Order of the Queſtion, and put each Man's Share of the Gain or Loſs in the Place of his Stock firſt laid out, and make the Sum of the Stocks ſtand in the Place of the whole Gain or Loſs, and then it will be,

As the Total Gain or Loſs,
Is to the Sum of the ſeveral Stocks:
So is each Man's Share of the Gain or Loſs,
To his particular Share in Stock.

Q. *What elſe doth this Rule belong to beſide Fellowſhip?*

A. By it the Eſtate of a Bankrupt may be divided among his Creditors: Alſo Legacies may be adjuſted, when there is a Deficiency of Aſſets or Effects.

EXAMPLES.

1. *A* and *B* were ſharers in a Parcel of Merchandize, in the purchaſe of which, *A* laid out 3 *l.* and *B* 7 *l.* and the Commodity being ſold, they find their clear Gain amount to 25 *s* what part of it muſt each Man have? *Anſw.* A *muſt have* 7 *s.* 6 *d* and B 17 *s.* 6 *d.*

2. *A*, *B*, and *C*, trading together, gained 120 *l.* which is to be ſhar'd according to each Man's Stock: *A* put in 140*l.* *B* 300 *l* and *C* 160 *l.* what is each Man's Share? *Anſw.* A 28 *l.* B 60 *l.* C 32 *l.*

3. Three Merchants trading to Virginia, loſe Goods to the Value of 800 *l.* Now if *A*'s Stock was 1200 *l.* *B*'s 4800 *l.* and *C*'s 2000 *l.* what Sum did each Man loſe? *Anſw.* A *loſt* 120 *l.* B 480 *l.* C 200 *l.*

4. Three Merchants traded together, and they put into one common Stock 1000*l.* each Man, and gained 600 *l.* how much muſt each Man have? *Anſw.* 200 *l. each Man.*

5. Four Men traded with a Stock of 800*l.* and they gain'd in two Years time twice as much and 40 *l* over: *A*'s Stock was 140*l.* *B*'s 260*l.* *C*'s 300*l.* I demand *D*'s Stock, and what

each Man gain'd by trading? *Anſw.* D's *Stock was* 100 *l. and* A *gain'd* 287 *l.* B 533 *l.* C 615 *l.* and D 205 *l.*

6. *A*, *B*, and *C*, trading to Guinea with 480 *l.* 680 *l.* and 840 *l* in three Years time did gain 1010 *l.* how much is each Man's Share of the Gain? *Anſw.* A 242 *l.* 8 *s.* B 343 *l.* 8 *s.* C 424 *l.* 4 *s.*

7. *A*, *B*, and *C*, freighted a Ship from the Canaries to England, with 108 Tuns of Wine, of which *A* had 48; *B* 36; *C* 24; but by reaſon of bad Weather, they were obliged to caſt 45 Tuns overboard; how much muſt each Man ſuſtain of the Loſs? *Anſw.* A 20 *Tuns*, B 15 *Tuns*, C 10 *Tuns*.

8. A Merchant is indebted to *S* 70 *l.* to *T* 400 *l.* to *V* 140 *l.* 12 *s.* 6 *d* but upon his Deceaſe, his Eſtate is found to be worth no more than 409 *l* 14 *s* how muſt it be divided among his Creditors? *Anſw.* S *muſt have* 46 *l.* 19 *s.* 3 *d.* 3 *qrs.* $\frac{141750}{146550}$.
T — — 268 7 7 1 $\frac{77250}{146550}$.
V — — 94 7 0 2 $\frac{74100}{146550}$.

9. If the money and effects of a Bankrupt amount to 1400 *l.* 14 *s.* 6 *d.* and he is indebted to *A* 742 *l.* 12 *s.* to *B* 641 *l.* 19 *s.* 8 *d.* and to *C* 987 *l.* 19 *s.* 9 *d.* how muſt it be divided among them? *Anſw.* A *muſt have* 438 *l.* 8 *s.* 4 *d.* 1 *qr.* $\frac{305527}{569417}$.
B —— — 379 0 3 3 $\frac{158361}{569417}$.
C —— — 583 5 9 3 $\frac{107129}{569417}$.

Of COMPOUND FELLOWSHIP.

Q. *What is Compound Fellowſhip?*

A Compound Fellowſhip is when the Stocks continue an unequal Term of Time.

Q. *What is the Rule?*

A. 1. Multiply each Man's Stock and Time together.
2. Add the ſeveral Products, thence ariſing together.
3. As the Sum of thoſe Products,
Is to the whole Gain or Loſs:
So is each Product,
To its Share of the Gain or Loſs.

Q. *How is this Rule proved?*

A. As in Single Fellowſhip.

EXAMPLES.

1. Three Merchants traded together: *A* put in 120 *l.* for 9 Months; *B* 100 *l* for 16 Months; and *C.* 100 *l.* for 14 Months; and they gain'd 100 *l.* how muſt it be divided? *Anſw.* A *muſt have* 26 *l.* 9 *s.* 4 *d.* 3 *qrs.* $\frac{3120}{4080}$.
B ——— 39 4 3 3 $\frac{240}{4080}$.
C ——— 34 6 3 1 $\frac{720}{4080}$.

2. Three Merchants join in Trade: *A* put in 400 *l.* for 9 Months; *B* 680 *l.* for 5 Months; and *C* 120 *l* for 12 Months, but by Misfortune loſt Goods to the Value of 500 *l.* what muſt each Man ſuſtain of the Loſs?

		l.	*s.*	*d.*	*qrs.*
Anſw.	A *muſt loſe*	213	5	4	3 $\frac{2840}{8440}$.
	B ———	201	8	5	0 $\frac{7840}{8440}$.
	C ———	85	6	1	3 $\frac{6200}{8440}$.

3. *A*, *B*, and *C*, hold a paſture in common, for which they pay 20 *l* *per annum.* In this paſture, *A* had 40 Oxen for 76 Days; *B* had 36 Oxen for 50 Days; and *C* had 50 Oxen for 90 Days, I demand what part every of theſe Tenants ought to pay of the 20 *l.*?

		l.	*s*	*d.*	*qrs.*
Anſw.	A *ought to pay*	6	10	2	1 $\frac{2340}{9140}$.
	B ——— ———	3	17	1	0 $\frac{2000}{9140}$.
	C ——— ———	9	12	8	2 $\frac{5000}{9140}$.

Of EXCHANGE.

Q. *WHAT is Exchange?*

A. Exchange is the giving the Money, Weight, or Meaſure of one Country, for the like Value in Bills, Money, Weight or Meaſure of another Country.

Q. *What is the Courſe of Exchange?*

A. It is the Value of Money agreed on among merchants.

Q. *Is the Courſe of Exchange always the ſame?*

A No: The Courſe of Exchange riſes and falls almoſt every Day, according as Money is plenty or ſcarce; or according to the Time allowed for payment of the money in Exchange; and then the Value is ſaid to be above or under Par.

Q. *What is the Par of Exchange?*

A. It is the intrinſic Value of any Foreign Money compared with Sterling Money.

Q. *What is the Agio?*

A. It is a Term uſed in ſome countries abroad, eſpecially in Italy, but never in England; and ſignifies the Difference between the Value of Bank Notes or Bank Money, and Current Money, in ſuch Places; that is, it is the Difference between the beſt money uſed in the Terms of Exchange; and the worſt uſed in Payment for Goods.

Q. *What is meant by Bank Notes or Bank Money?*

A. Bank Notes are obtained from foreign Bankers, for money lodged in their Banks, which money is called Bank-Money.

Q. *What is Current Money?*

A. It is ſuch as paſſes from Hand to Hand, in the receiving and paying ſuch Sums as are due from one Man to another; commonly called Running Caſh.

Q. *What is Uſance?*

A. It is a certain time allowed for the Payment of Bills of Exchange; but different according to the Uſage or Cuſtom of the Place where the Bill is made, compared with the Diſtance of that Place on which the Bill is drawn, that is, the nearer the Place is on which the Bill is drawn, is to the Place where it was drawn, the time is the ſhorter; but the farther thoſe Places are from each other, the length of time allow'd for the Payment of that Bill, from the Date of it, is the greater.

Note, Bills are Payable five Ways, viz.

1. At Sight
2. At ſo many Days after Sight.
3. At Uſance, or a certain length of time agreed on between the two Places.
4. At Double Uſance, which is double the time agreed on between the two Places.
5. At Marts or Fairs; which is to be underſtood at ſome certain Days accounted for Fairs in the ſaid Places where the Bills are made payable.

Q. *What are Days of Grace?*

A. In London it is cuſtomary to allow three Days to the time mentioned in the Bill, which are called Days of Grace, on the laſt Day of which (if it be not on a Sunday, but if it is on Saturday) the Bill muſt be demanded, and if not then paid, muſt be immediately proteſted.

Note, In ſome Places they allow a larger Number of Days of Grace, than we do at London; and in others none at all.

Q. *How are Queſtions in Exchange proved?* 2

A. By changing the Order of them.

CASE 1.

Q. *What Places does London exchange with in Dollars, or Pieces of Eight of Mexico?*

A. With Madrid and Cadiz in Spain, and with Genoa, and Leghorn in Italy.

Q. *How do they keep their Accompts in Spain?*

A. In Rials and Marvedies.

Note, 372 Marvedies make 1 Rial.
8 Rials ———— 1 Piece of Eight.

Q. *What is the Par of Exchange between London and Spain?*

A. The Par of the Money between London and Spain, is, that 1900 Rials are exactly equal to 51 *l*. Sterling; conſequently 1 Rial is worth 6 *d*. 1 *qr*. $\frac{73}{95}$.

Note 1. Spain gives to London 1 Dollar or Piece of Eight for an uncertain Number of Pence Sterling.

2. In Spain they allow 14 Days of Grace.

Q. *How do they keep their Accompts in Italy?*

A. In Livres, Sols, and Deniers; ſome few cities excepted.

Note 1. 12 Deniers make 1 Sol.
20 Sols 1 Livre.
5 Livres 1 Piece of Eight at Genoa.
6 Livres 1 Piece of Eight at Leghorn.

2. The Uſance of Genoa to London is 3 Months after Date.

3. At Genoa they allow 30 Days of Grace.

EXAMPLES.

1. What is the Amount of 63 *l.* Sterling in Pieces of Eight, at 56 *d per* Piece? *Anſw.* 270 *Pieces of Eight.*

2. A Factor hath ſold Goods at Cadiz for 1468 Pieces of Eight, at 4 *s.* 6 *d.* 2 *qrs per* Piece; how much Sterling is the Sum? *Anſw.* 333 *l.* 7 *s.* 2 *d.*

A Bill of Exchange, viz. *Leghorn on London.*

Leghorn July 31, 1771, *for* 786 *Pieces of Eight of Mexico, at* 55 *d. Sterling per Piece of Eight, at* 3 *Months.*

Three months after Date, pay this my firſt of Exchange to Mr James La Morte, or Order, ſeven hundred and eighty-ſix Pieces of Eight of Mexico, for the Value received of himſelf, at 55 *d* Sterling *per* Piece, and place it to Accompt, as *per* Advice from

Your humble Servant,

To Mr William Mayhew,
Merchant in London.

James Douglas.

How much money muſt be received in England for this Bill? *Anſw.* 180 *l.* 2 *s.* 6 *d.*

CASE 2.

Q. *What places does London exchange with in Ducats?*

A. With Venice in Italy.

Note, 6 Solidi make 1 Groſs.
24 Groſſes 1 Ducat.

Q. *What is the Par of Exchange between London and Venice?*

A. One hundred Livres are worth three Pounds Sterling.

Q. *How many ſorts of Ducats are there at Venice?*

A. Two ſorts, *viz.* Ducats Banco, or Bank Ducats, which are uſually given in Exchange; and Ducats Picoli, or Current Ducats, which are uſually bargained for and paid in the Purchaſe of Goods and Merchandizes, and are 20 *per cent.* worſe than the Bank Ducats.

Note, 1 The Par of the Ducat Banco is 52 Pence Sterling; and the Par of the Ducat Picoli is 40 Pence Sterling.

2. The Uſance of Venice to London and back again is 3 Months, or 90 Days after Date: Two Uſance is that time doubled.

EXAMPLES.

1. If 100 Livres are worth 3 *l.* Sterling, what is 1 Livre worth? *Anſw.* 7 *d.* $\frac{1}{5}$ *Sterling.*

2. There are 2000 Ducats, at 4 *s.* 4 *d.* each, remitted to London, to be paid in pounds Sterling; what is the amount? *Anſw.* 433 *l.* 6 *s.* 8 *d*

3. A Bill of 100 *l.* Sterling is remitted to Venice, to be paid in Ducats, at 4 *s.* 4 *d.* each; what is the amount? *Anſw.* $461\frac{28}{52}$ *Ducats*

4. A Traveller would exchange 233 *l.* 16 *s.* 8 *s.* Sterling, for Venice Ducats, at 4 *s.* 9 *d.* *per* Ducat; how many muſt he have? *Anſw* $984\frac{32}{57}$ *Ducats.*

A Bill of Exchange, viz. *Venice on London.*

Venice, Auguſt 17th, 1771, for 4000 *Ducats Banco, at 54d.¼ Sterling per Ducat, at Uſance.*

At Uſance, pay this my firſt Bill of Exchange, to Mr. Abraham Jennings, or Order, Four Thouſand Ducats, at Fifty-four pence farthing Sterling *per* Ducat, Value received; and place it to the Accompt of

Your humble Servant,

To Samuel Jones, eſq;
Merchant in London.

William Sherſton.

I demand the Value of this Bill in Sterling money? *Anſw.* 904 *l.* 3 *s.* 4 *d.*

Another, viz. *London on Venice.*

London, September 14, 1771, for 904 *l.* 3 *s.* 4 *d. Sterling, to be paid at Venice, in Ducats, at 54 d.¼ Sterling per Ducat Banco, at Uſance.*

At Uſance, pay this my ſecond Bill of Exchange, my firſt not paid, to Mr. Samuel Dobbins, or Order, Nine Hundred and four Pounds, three Shillings and four pence Sterling, in Ducats, at fifty-four pence Farthing *per* Ducat, Value in myſelf, and place it to Accompt, as *per* Advice from

To Mr. James Torriano,
Merchant at Venice.

Your humble Servant,
Michael Taſſio.

What is the Value of this Bill in Ducats Banco? *Anſw.* 4000 *Ducats.*

CASE 3.

Q. *What places does London exchange with for French Crowns?*

A. With Paris, Lyons, Rouen, *&c.* in France.

Q. *How do they keep their Accompts in France?*

A. In Livres, Sols, and Deniers.

Note, 1. 12 Deniers make 1 Sol.
20 Sols 1 Livre.
8 Livres 1 Crown.

2. The Livre is imaginary.

3. By an Order of Lewis XV. their Money is brought to the Engliſh Standard, for the benefit of Trade.

Q. *What is the Par of Exchange between London and France?*

A. One Livre is worth 18 *d.* Sterling; and one Crown is worth 4 *s.* 6 *d.* Sterling.

Note 1. In France they allow 10 Days of Grace; but when Bills are drawn at Sight, they are payable the ſame Day

2. The Uſance between France and London is one Month, conſiſting of 30 Days.

EXAMPLES.

1. A Bill of 200 *l.* is remitted to Paris by a Merchant in London; what is the value in French Crowns, at 4 *s.* 6 *d.* each? *Anſw.* 888 48/54 *Crowns*

2. There are 800 French Crowns, at 4 *s.* 6 *d* each, remitted to London by a Merchant in Paris; what is the value in pounds Sterling? *Anſw.* 180 *l. Sterling.*

A Bill of Exchange, viz. *Paris on London.*

Paris, *October* 17, 1771, *for* 1000 *Crowns*, *at* 4 *s.* 2 *d.* *at* 2 *Uſance.*

At double Uſance, pay this my ſecond Bill of Exchange, my firſt not paid, to Mr. James Jackſon, or Order, the ſum of one thouſand Crowns, at four ſhillings and two pence *per* Crown, value received, and place it to the Accompt, as *per* Advice of

Your humble Servant,

To Mr. Simon Surepay,
London

Daniel Abbott.

What is the Value of this Bill in Sterling Money? *Anſw.* 208 *l.* 6 *s.* 8 *d.*

CASE 8.

Q. *What Places does London exchange with for Mill-Reas?*

A With Oporto and Liſbon, *&c* in Portugal; and with the Iſland of Madeira.

Q. *How do they keep their Accompts in Portugal?*

A. In Reas.

Note 1, 1000 Reas make 1 Mill Rea.

2. They ſeparate the Reas from the Mill Reas by ſome particular Mark, thus, 687(:)496 that is, 687 Mill Reas, and 496 Reas, which is the ſame with 687496 Reas.

3 Very near 14 Reas, or 13⅓ Reas make 1 Penny Engliſh

Q. *What is the Par of Exchange between London and Portugal?*

A. One Mill-Rea is worth 5 *s.* 7 *d* ½, which appears thus;

800 Reas (or 8 Teſtoon Piece)	are =	4 *s.*	6 *d.*
200 Reas (or fourth-part)	are =	1	1½
1000		5	7½

Note, The Uſance between London and Portugal is two Months, or 60 Days after Date.

EXAMPLES.

1. If a Bill is drawn from Liſbon of 1432 Mill-Reas, at 6 *s.* 8 *d. per* Piece, how much Engliſh Money is that Bill? *Anſw.* 477 *l.* 6 *s.* 8 *d.*

2. If a Bill be drawn from London of 1333 *l.* 6 *s.* 8 *d.* Sterling, how much is it at Liſbon in Mill-reas, at 6 *s.* 8 *d.* each? *Anſw.* 4000 *Mill-reas.*

A Bill of Exchange, viz. *Liſbon on London.*

Liſbon, October 14, 1771, *for* 4761(:)764, *at* 5 *s.* 8 *d. at Uſance.*

At Uſance, pay this my firſt of Exchange to Mr. Henry Sozomon, or Order, four thouſand ſeven hundred and ſixty-one Mill-reas, ſeven hundred and ſixty-four Reas, at five ſhillings and eight-pence Sterling *per* Mill-rea, Value receiv'd; and place it to the Accompt of

Your humble Servant,

To Mr. Jacques Jolliffe,
Merchant in London.

John Minors.

What is the Value of this Bill in Sterling Money? *Anſw.* 1349 *l.* 3 *s.* 3 *d.* 3 *qrs* $\frac{808}{1000}$.

CASE 5.

Q. *What Place does London exchange with for Ducatoons, Crowns or Ecues?*

A. With Florence in Italy.

Q. *How do they keep their Accompts at Florence?*

A. In Ecues, Sols, and Deniers Picoli or Current.

Note, 12 Deniers make 1 Sol.
20 Sols — 1 Ecu, Crown or Ducatoon.

Q. *What is the Par of Exchange between London and Florence?*

A. One Ecu, Crown or Ducatoon is worth 60 *d.* Sterling.

Note, The Uſance between Florence and London, is 3 Months, or 90 Days after Date.

EXAMPLES.

1. A Bill of 120 Ducatoons is remitted from Florence, at 53 *d.* each; what is the Value in Pounds Sterling? *Anſw.* 26 *l.* 10 *s.*

2. A Bill of 220 *l.* 16 *s.* 8 *d* is drawn from London, what is the Value at Florence in Ducatoons, or Ecues, at 53 *d.* $\frac{1}{2}$ each? *Anſw* 990 $\frac{70}{107}$ *Ecues.*

A Bill of Exchange, viz. *Florence on London.*

Florence, October 19, 1773, *for* 1876 *Ecues, at* 63 *d. Sterling per Ecu, at Uſance.*

At Uſance, pay this my third of Exchange, my firſt and ſecond not paid, to Mr. Jonathan Farmento, or Order, one thouſand eight hundred and ſeventy-ſix Ecues, at 63 *d.* Sterling *per* Ecu, Value receiv'd, and place it to the Accompt of

Your humble Servant,

To Mr. John Jamieſon,
merchant in London.

Michael Taſſioni.

What is the Value of this Bill in Sterling Money? *Anſw.* 492 *l.* 9 *s.*

CASE 6.

Q. *What Place does London exchange with for Florins?*

A. With Frankfort in Germany.

Q. *How do they keep their Accompts in Frankfort?*

A. In Goulds, Cruitzers and Deniers, or Fennings.

Note, 8 Fennings, or 4 Deniers make 1 Cruitzer.
60 Cruitzers - - - - 1 Gould, or Guilder.

Q. *What is the Par of Exchange between London and Frankfort?*

A. Twenty Florins are equal to 3 *l.* Sterling.

Note, When they exchange or negotiate Bills for London, Holland or Flanders, the Bills are paid in Goulds of 65 Cruitzers; and for France, Hamburgh and Italy, in Goulds of 60 Cruitzers; and ſometimes in Rix-Dollars at 4 s. 6 d. Sterling, and at ſo much per Cent. Profit or Loſs.

EXAMPLES.

1. If 20 Florins are equal to 3 *l.* Sterling, what is the worth of 1 Florin? *Anſw.* 3 *s. Sterling.*

2. If 1000 *l.* Sterling be remitted to Frankfort, what is the Value in Florins, at 39 *d. per* Piece? *Anſw.* 6173$\frac{33}{39}$.

3. If 100 Florins at 40 *d.*$\frac{1}{2}$ each, be remitted from Frankfort to London, what is the Value in Pounds Sterling? *Anſw.* 16 *l.* 17 *s.* 6 *d.*

A Bill of Exchange, viz. *London on Frankfort.*

London, September 12, 1771, *for* 763 *l.* 10 *s. Sterling, to be paid in Florins, at* 41 *d. Sterling each, at Uſance.*

At Uſance, pay this my ſecond of Exchange, my firſt not paid, to Mr. Jacobus Sanderſon, or Order, ſeven hundred ſixty-three Pounds, ten ſhillings Sterling, in Florins, at 41 *d.* Sterling *per* Florin; Value received; and place it to Accompt as *per* Advice from

Your humble ſervant,

To Mr. William Maron,
merchant in Frankfort.

James Johnſon.

What is the Value of this Bill in Florins? *Anſw.* 4469$\frac{11}{41}$ *Florins.*

CASE 7.

Q. *What Places does London exchange with by the Pound Flemiſh or Pound Sterling?*

A. With Antwerp, Bruſſels, Amſterdam, Rotterdam, and all parts of the Spaniſh and United Provinces. Alſo with Hamburgh in Germany.

Q. *How do they keep their Accompts in theſe Places?*

A. Some in Pounds, Shillings and Pence, as in England; and others in Guilders, Stivers and Pennics.

Note 1. 16 Pennics make 1 Stiver.
20 Stivers - 1 Guilder. Alſo,
6 Stivers - 1 Shilling
6 Guilders - 1 Pound Flemiſh.

2. The Par of Exchange between London and Holland is, that 9 L. Sterling are equal to 100 Florins

3. A Florin is worth 3 s. 2 d $\frac{2}{5}$ Flemiſh

4. The prices of the exchanges at London, Hamburgh, and Amſterdam, are ſaid to have a very great influence upon all the reſt of Europe.

Q *What is the Par of Exchange between London and Antwerp?*

A. Sixteen Pounds Flemiſh are equal to nine Pounds Sterling: So that 1 *l.* Flemiſh is equal to 11 Shillings and 3 Pence Sterling; and 1 *l.* Sterling is equal to 35 *s* 6 *d* $\frac{2}{3}$ Flemiſh.

EXAMPLES.

1. Being deſirous to remit to my Correſpondent at London, the ſum of 2000 *l.* 12 *s* 6 *d* Flemiſh, to diſpoſe of according to my Order, Exchange at 34 *s* 6 *d.* Flemiſh *per* Pound Sterling; how much Money Sterling ſhall I be Creditor for in the City of London aforeſaid? *Anſw.* 1159 *l.* 15 *s.* 7 *d.* 3 *qrs* $\frac{126}{414}$.

2. My Correſpondent in England gives me notice that he has diſburſed in Merchandize, upon my Account, the ſum of 1000 *l* Sterling; what ſum muſt I anſwer for that in Holland, the Courſe of Exchange being at 33 *s.* 4 *d* Flemiſh for one Pound Sterling? *Anſw* 1660 *l.* 3 *s.* 4 *d* *Flemiſh.*

Note, When the Courſe of Exchange is at 33 s. 4 d Flemiſh for 1 Pound Sterling, then to bring Flemiſh Money into Engliſh Money, multiply the Flemiſh Money by 3, and divide that Product by 5, the Quotient will give the Anſwer in Pounds Sterling And the contrary

3. My Correſpondent in Rotterdam ſends me word, that he has diſburſed upon my Account, the ſum of 3060 Guilders and 15 Stivers; what ſum muſt I anſwer for that at London, the Courſe of Exchange being at 37 *s.* 9 *d.* Flemiſh *per l.* Sterling? *Anſw.* 270 *l.* 5 *s* 3 *d* 2 *qrs.* $\frac{188}{455}$.

Note, A Stiver is 2 d. Flemiſh, and a Guilder 40 d.

4. A Merchant delivered at London 120 *l.* Sterling, to receive 147 *l.* Flemiſh in Amſterdam; how much was 1 *l.* valued at in Flemiſh Money? *Anſw* 1 *l.* 4 *s.* 6 *d.*

5. If 1 Florin is worth 3 *s.* 2 *d.* $\frac{2}{5}$ Flemiſh, and 100 Florins are equal to 9 *l.* Sterling, how much is the real worth of 1 *l.* Sterling in Flemiſh Money? *Anſw.* 35 *s.* 6 *d.* $\frac{6}{9}$.

1 *fl.* : 3 *s.* 2 *d.* $\frac{2}{5}$: : 100 *fl.* : 16 *l. Flem.*
9 : 16 : : 1 : 35 *s.* 6 *d.* $\frac{6}{9}$ *Flem.*

Of

Of reducing the Current Money of Holland into Bank Money, and the Contrary.

EXAMPLES.

1. Being in Holland, I have 1000 Guilders, Current Money, which I would turn into Bank Money, the Agio being at 5 Guilders *per Cent.* how much is it? *Anſw.* 952 *Guilders Banco* $\frac{40}{105}$.

G.Cur. G.B. G.Cur. G.B.
105 : 100 : : 1000 : $952\frac{40}{105}$.

2. My Correſpondent in Amſterdam having wrote me word that he had by him of mine 2763 Guilders, 15 ſtivers, Currency, I have directed him to turn the ſame into Bank Money, the Agio being (as I am informed) 5 Guilders ½ *per Cent.* I demand how much Bank Money it will make? *Anſw.* 2619 *Guilders* $13\frac{77}{211}$ *Stivers Bank Money.*

G.Cur G B. G. S.Cu. G B. S.
105½ : 100 : : 2763 „ 15 : 2619 $13\frac{77}{211}$.

3. Holland is indebted to London 7681 Guilders, Current Money, and would know how much Sterling it will amount to, Exchange at 35 *s.* 6 *d.* Banco *per l.* Sterling, Agio at 5 *per Cent.* how much is it? *Anſw* 686 *l.* 17 *s.* 6 *d.* $\frac{60}{420}$ *Sterling.*

G C. G.B° G C G.B° St. Pen.
105 : 100 : : 7681 : 7315 4 $1\frac{55}{105}$.
s. d. l St. G B° S P.
35 6 : 1 : : 7315 4 1 : 686 *l.* 17 *s.* 6 *d.* 1 *qr.* $\frac{60}{420}$

4. Amſterdam remits to London 1090 Guilders, 17½ Stivers, at 33 *s* 8 *d.* Banco *per l.* Sterling: What will this Remittance amount to at London in Sterling Money? *Anſw.* 108 *l* 0 *s.* 1 *d* 3 *qrs.* $\frac{52}{404}$ *Sterling.*

Note, The above money is ſuppoſed to be reduced into Bank money already.

s. d. l St. G. S.B° £. s. d. qrs.
33 8 : 1 : : 1090 „ 17½ : 108 0 1 $3\frac{52}{404}$.

Of the Sale of Gold in Holland.

Note, All Gold is bought and ſold at Amſterdam by Weight; that is, 355 Guilders Current per Mark of that Weight.

EXAMPLES.

A Merchant in London ſends over to his Correſpondent at Amſterdam 1000 Moidores, valued at 27 *s.* Sterling each, the Charges on ſhipping came to 5 *l.* 19 *s* 6 *d.* When they came to the Place conſign'd, and were weighed, they amounted to 14209 Guilders, 14 Stivers Currency, all Charges there deducted; I demand what was their Value in Engliſh Money, and how much the London Merchant gained or loſt by his

Moidores, admitting the Agio to be 5 Guilders *per Cent.* and the Courſe of Exchange 34 *s.* 6 *d.* *B*° Flemiſh *per l.* Sterling? *Anſw.* 12 *l.* 15 *s.* 4 *d.* *loſs.*

```
1.  1000 Ms.+ 5 l. 19 s. 6 d.=1355 l. 19 s. 6 d.
     G.   G.    G.      St.     G.   St.
2,  100 : 5 :: 14209 „ 14 : 710   9
    Gu      St.  Gu.   St.   Gu.    St.
3.  14209 „ 14—710 „ 9= 13499 „ 5
      s. d.   l.     G.     S.    l.    s.  d.
4.     33 6 : 1 :: 13499 „ 5 : 1543   4   2
5.  1355 l. 19 s  6 d—1343 l  4 s. 2 d = 12 l. 15 s. 4 d.
```

A Bill of Exchange, viz. *London on Rotterdam.*

London, September 14, 1771, *for* 436 *l.* 17 *s. Sterling, at* 34 *s.* 6 *d. Flemiſh, per l, Sterling, at Uſance.*

At Uſance, pay this my firſt of Exchange, to Jacob Van Hoove, or Order, four hundred thirty-ſix Pounds, ſeventeen ſhillings Sterling, Value received of William Johnſon, Eſq; and place it to Accompt, as *per* Advice from

To Mr. James Juliers,
merchant, Rotterdam.

Your humble ſervant,
Thomas Cartwright.

What is the Value of this Bill in Flemiſh Money? *Anſw.* 753 *l.* 11 *s.* 3 *d* $\frac{12}{20}$

Alſo in Guilders and Stivers? *Anſw.* 4521 *Guil.* 7 *Stiv.*

```
 s.  d.              l.    s.
 34  6              436   17
 12                       414
----             -----------
414                1747    8
----               4368    5
                  174740   0
                 ----------- Gu.   St.
        4|0)18085|5  13(4521    7 Anſw.
                 15 -----------
```

Another, viz. *Rotterdam on London.*

Rotterdam, September 19, 1771, *for* 7693 *Guilders*, 17 *Stivers, at* 35 *s.* 6 *d. Flemiſh per l. Sterling.*

At Uſance, pay this my ſecond Bill of Exchange, my firſt not paid, to James Truelove, or Order, ſeven thouſand ſix hundred, ninety-three Guilders, ſeventeen Stivers, at 35 *s.* 6 *d.* Flemiſh *per l.* Sterling, Value received of Jaques Jacobſon, and place it to Accompt, as *per* Advice from

To James Jollies, eſq;
merchant at London.

Your humble ſervant,
Johannes Van Schooten.

What is the Value of this Bill in Sterling Money? *Anſw.* 722 *l.* 8 *s.* 6 *d.* 2 *qrs.* $\frac{60}{426}$.

To know how much is gain'd or loſt per Cent. on the riſing or falling of the Price of Exchange.

EXAMPLES.

1. London draws upon Holland for any ſum of Money, Exchange at 35 *s.* 4 *d* Flemiſh *per l.* Sterling: In three Weeks or one Month afterwards, London draws on Holland again, Exchange at 34 *s.* 4 *d.* I demand what London gains *per Cent.* by this Negotiation? *Anſw* 2 *l.* 17 *s.* 11 *d.* 2 *qrs.* $\frac{252}{414}$ *Gain.*

s.	*d.*		*s.*		*l.*		*l.*	*s.*	*d.*	*qrs.*
34	4	:	1	::	100	:	2	17	11	2 $\frac{252}{414}$

2. London draws upon Amſterdam, Exchange at 34 *s.* 4 *d.* Flemiſh *per l.* Sterling. And in five Weeks time draws again, the Exchange being at 35 *s.* 4 *d.* how much is loſt *per Cent.* by this Tranſaction? *Anſw.* 2 *l.* 17 *s.* 11 *d.* 2 *qrs.* $\frac{252}{414}$.

Note, Hence it is to be obſerved, that the lower the Price of Exchange is, the greater is the gain at London, and the contrary when it is higher: But the Caſe is juſt the reverſe at Holland.

CASE 8.

Q. *What Places does London Exchange with by the Pound Sterling, or Pound Currency?*

A. In all the Britiſh Dominions in America, in the Weſt-Indies, and in Ireland.

Q. *How do they keep their Accompts in thoſe Places?*

A. As they do in London, that is, in Pounds, Shillings, Pence and Farthings: but with this Difference, that in London they call their Money Sterling, but in all the Weſtern Dominions they call it Currency.

Q. *Why is the Money called Currency in the weſtern Dominions?*

A. Becauſe they have very few Coins of any ſort circulating among them; excepting in the Engliſh Iſlands there; and therefore are obliged to deal in what they call Paper-Money.

Note 1. Notes of Hand paſs commonly among the People; and in New England they are ſaid to be given for ſo ſmall a ſum as five Shillings. Now as this Paper-Money is ſubject to many Caſualties, it cauſes a very great Undervaluement of their Currency, and is ſometimes, and in ſome places at 6 or 700 Pounds Currency for 100 Pounds Sterling, or Money that is good Silver or Gold.

2. In all the Engliſh Iſlands in the Weſt-Indies, they have ſo great a plenty of Foreign Coins, that their Currency is ſometimes at no greater Diſcount than 25 per Cent. or 125 l. Currency for 100 l. Sterling, and ſeldom more than 50 per Cent.

3. The Weights and Meaſures, in the Britiſh Colonies and Plantations, are the ſame as thoſe in London, differing only in their Kintals or Hundred Weight, their Hundred being only 100 lb. Avoirdupois; and that of London 112 lb.

Q. *What Foreign Coins uſually paſs in the Britiſh Colonies and Plantations?*

A. Theſe following; the values of which were aſcertained by an Act of Parliament made in the ſixth Year of Queen Ann.

	Weight.		*True V.*		*Cur. Val.*		
	dwt.	*gr.*	*s.*	*d.*	*s.*	*d.*	*f.*
Pieces of Eight (old plate of Seville)	17	12	4	6	6	0	0
Ditto of new - - -	14	0	3	7¼	4	9	2⅔
Mexico ditto - - -	17	12	4	6	6	0	0
Piller ditto - - -	17	12	4	6¾	6	0	0
Peru ditto (old Plate) - -	17	12	4	5	5	10	2⅔
Croſs Dollars - - -	18	0	4	4¾	5	10	1¼
Ducatoons of Flanders -	20	21	5	6	7	4	0
French Crowns or Ecues -	17	12	4	6	6	0	0
Cruſadoes of Portugal - -	11	4	2	10¼	3	9	2⅔
Three Guilder Pieces of Holland	20	7	5	2¼	6	10	3⅔
Old Rix Dollars of the Empire	18	10	4	6	6	0	0

Note 1. Pieces of the ſame Weight, and not of the ſame Value, may be preſumed to be occaſioned by the difference of Fineneſs.

2. To remedy the inconveniencies which were cauſed by the different Rates at which Pieces of the ſame Species were Current, it was ordered by Proclamation, and confirmed by the aforementioned Act of Parliament, that after the firſt Day of January, 1704, no Piller, Mexico, or Seville Pieces of Eight, tho' of full Weight as above, ſhall be received nor paid at above ſix Shillings a-piece; and the halves, quarters, and other leſſer pieces in proportion. And the ſaid Act enjoins, That if any one ſhall receive or pay any of the ſaid pieces for any more than as above ſpecified, ſuch perſon ſhall forfeit ten Pounds.

EXAMPLES.

1. A Merchant in New England ſtands indebted to his Correſpondent in London, in 4960 *l.* 17 *s.* 6 *d.* Currency; what Sum muſt he anſwer for that at London aforeſaid, when the Currency is at 300 *per cent*? *Anſw.* 1653 *l.* 12 *s.* 6 *d. Sterling.*

2. My Correſpondent in Georgia ſtands indebted to me for Merchandize, in the Sum of 120 *l.* 6 *s.* 9 *d.*½ Sterling; how much is that in their Currency, at 500 *per cent*? *Anſw.* 601 *l.* 13 *s.* 11 *d.*½ *Currency.*

3. Trading to Jamaica, my employer there owes me 176 *l.* 12 *s.* 8 *d.* Sterling, how much is that in their Currency, at 25 *per cent*? *Anſw.* 220 *l.* 15 *s.* 10 *d. Currency.*

4. I have lately purchaſed in Ireland, effects to the Value of 400 *l.* 17 *s.* 9 *d.* of that place; what ſum muſt I anſwer for that at London, exchange at 10 *per C*? *Anſ.* 364*l.* 8*s.* 10*d.* 1 *qr.*$\frac{120}{364}$.

5. My Correſpondent at London, draws upon me for 364 *l.* 8 *s.* 10 *d.*½ Sterling; what Sum muſt I anſwer for that at Dublin, exchange at 8½ *per cent*? *Anſw.* 395 *l.* 8 *s.* 5 *d* $\frac{1464}{9600}$.

CASE

CASE 9.

Q. *What Places does London exchange with for their Crown or Rix Dollar?*

A. With Geneva in Switzerland.

Q. *How do they keep their accompts in Geneva?*

A. In Livres, Sols and Deniers.

Note 1. 12 Deniers make 1 Sol.
20 Sols - 1 Livre.
3 Livres - 1 Rix-Dollar.

2. The Par is, that 1 Rix Dollar is equal to 4 s. 6 d. Sterling: but in exchange it goes for 50 d. to 60 d. Sterling.

EXAMPLES.

1. London draws upon Geneva for 796 *l.* 10*s.* 6*d.* Sterling, what ſum does that amount to in Rix-dollars, at 53 *d. per* Dollar? *Anſw.* $3606\frac{48}{53}$ *Rix-Dollars.*

2. A Merchant in Geneva draws upon his Correſpondent at London, for 1960 Livres, Exchange at 56 *d. per* Rix-Dollar; how much Sterling muſt be paid in London to anſwer that Bill? *Anſw.* 152 *l.* 8 *s* 10 *d.* $\frac{1}{2}$.

$\frac{1960}{3}=653\frac{1}{3}$ 1 : 56 :: $653\frac{1}{3}$: 152 *l.* 8 *s.* 10 *d.* $\frac{1}{2}$+

A Bill of Exchange, viz *London on Geneva.*

London, October 19, 1771, *for* 376 *l.* 11 *s* 8 *d. Sterling, to be paid in Rix-dollars, at* 58 *d Sterling each, at Uſance.*

At Uſance, pay this my only Bill of Exchange, to Mr. Janſon Cramonville, or Order, three hundred ſeventy-ſix Pounds, eleven Shillings and eight Pence Sterling, in Rix-Dollars, at fifty-eight Pence Sterling *per* Rix-Dollar, Value received, and place it to the Accompt of

To Mr. Abraham Schulhauſen,
Merchant in Geneva.

Your humble Servant,
Jacobus Schomberg.

What is the Value of this Bill in Rix-Dollars? *Anſw.* $1558\frac{16}{58}$ *Rix-Dollars.*

CASE 10.

Q. *What particular Piece of Money does London exchange with Denmark for?*

A. For Rix-Dollars; one being valued at about 4 *s.* 6 *d.* Sterling.

Q. *How do they keep their accompts in Denmark?*

A. In Marks and ſhillings.

Note 1. 16 Shillings make 1 Mark.
6 Mark 1 Rix-Dollar.

2. The Rix-Dollar, in Exchange, goes for 45 d. to 58 d. Sterling.

EXAMPLES

1. London draws on Copenhagen in Denmark for 184*l.* 16*s.* 7 *d.* Sterling; what ſum muſt be anſwered for that in Rix-Dollars, at 50 *d.* each? *Anſw.* $887\frac{9}{50}$ *Rix-Dollars.*

2. My Correſpondent in London ſtands indebted to me, according to my Books, in the ſum of 1000 Rix-Dollars, what ſum muſt he anſwer for that at London aforeſaid, when the Rix-Dollar, by way of Exchange, is valued at 58 *d.*$\frac{1}{2}$? *Anſw.* 243 *l.* 15 *s.*

3. A Merchant in London draws upon his Correſpondent in Copenhagen, for 400 *l.* Sterling, but will give no more for a Rix-Dollar than 55 *d.* Sterling, that being the price of Exchange; how many Rix-Dollars muſt he receive, and what is his whole Loſs, and the Loſs *per cent.* they being above Par? *Anſw.* 1745$\frac{25}{55}$ *Rix-Dollars: The whole loſs was* 7 *l.* 5 *s.* 3 *d. and the loſs per Cent.* 1 *l.* 16 *s.* 3 *d* $\frac{3}{4}$.

d. *Dol.* *l.* *Dol.*
55 : 1 :: 400 : 1745$\frac{25}{55}$.
1745$\frac{1}{2}$ at 4 *s.* 6 *d* = 392 *l.* 14 *s.* 9 *d. at Par.*
400 *l.* — 392 *l.* 14 *s.* 9 *d.* = 7 *l.* 5 *s.* 3 *d. loſs.*
$\frac{7\;5\;3}{4}$ = 1 *l.* 16 *s.* 3 *d.*$\frac{3}{4}$ *loſs per cent.*

CASE II.

Q. *What place does London exchange with for the copper dollar?*

A. With Stockholm in Sweden.

Q. *How do they keep their accompts in Stockholm?*

Q. In Rix-Dollars, Copper Dollars, and Runſtics.

Note 1. 32 Runſtics make 1 Copper Dollar.
6 Copper Dollars 1 Rix Dollar.

2. The Par of the Rix Dollar is equal to about 6 s. Sterling; conſequently the Par of the Copper Dollor is equal to 1 s. Sterling, or 20 Copper Dollars make 1 l Sterling, tho' the Courſe of Exchange is ſometimes to 28 or 30 Copper Dollars per pound Sterling

3. In England ſums of Money are paid in the beſt ſpecies, viz. Guineas, by which means 1000 l. or more may be put into a ſmall Bag, and conveyed away in the pocket; but in Sweden they often pay ſums of Money in Copper, and the Merchant is obliged to ſend Wheel-barrows inſtead of Bags to receive it.

EXAMPLES.

1. A Merchant in Stockholm draws upon his Correſpondent in London, for 1184 Rix-Dollars; what ſum muſt he anſwer for that in London aforeſaid, when the Courſe of Exchange is at Par? *Anſw* 355 *l.* 4 *s.*

2. Stockholm draws upon London for 1276 Rix-Dollars; what ſum muſt London anſwer for that, Exchange at 25 Copper Dollars *per l.* Sterling, and what is gained or loſt by the Drawer at Stockholm aforeſaid? *Anſw* 306 *l.* 4 *s.* 9 *d.* 2 *qrs.* $\frac{2}{5}$ *the Bill; and the Drawer loſes* 76 *l.* 11 *s.* 2 *d* 1 *qr.* $\frac{3}{5}$.

25 : 1 :: 1276 × 6 : 306 4 9 2$\frac{2}{5}$ *the value of the Bill.*
25 : 5 :: 7656 76 11 2 1$\frac{3}{5}$ *loſs.*

Having given ſeveral Bills of Exchange to be reduced into Sterling or Foreign Money; it may not be amiſs to give the form how a Bill Book ſhould be kept, that a Merchant may know at Sight what Bills he has to pay, and what to receive, and when to pay and receive them.

1. Bills Payable, *i. e.* ſuch as you have accepted.

The Drawer's Name and Place of Reſidence.	Date of the Bill.	The Time of Payment.	Payable to whom, or Order.	The Sum drawn for.	Price of Exchange.	For or by whom accepted, and Place of Abode.	The Sum Sterling.	When due	Paid, or refus'd Acceptance
Will. Sherſton of Venice.	17. *Aug*	3 Months.	*Abraham Jennings.*	Ducats Bo. 4000	Sterling 54*d.*¼.	*William Denny*, Rood-lane.	*l.* *s.* *d* 904 3 4	15 *Nov.*	Paid.

2. Bills Receivable, *i. e.* ſuch as you have in your Poſſeſſion.

The Drawer's Name and Place of Reſidence.	Date of the Bill.	The Time of Payment.	Payable to whom, or Order.	The Sum drawn for.	Price of Exchange.	For or by whom accepted, and Place of Abode.	The Sum Sterling.	When due.	Receiv'd or returned, proteſted for non-acceptance or non-payment.
Mich. Taſſioni Florence.	9. *Oct.*	3 Months	*James Edwards.*	Ecues 1876	Sterling 63*d.*		*l.* *s.* 492 10	17 *Jan.*	Proteſted for non-acceptance.

CASE 12.

Of the Compariſon of WEIGHTS *and* MEASURES.

EXAMPLES.

1. If 112 *lb.* at London make 99 *lb.* at Liſbon; how many *lb.* at London are equal to 1049 *lb.* at Liſbon? *Anſw.* 1186 *lb.* $\frac{74}{99}$.

2. If 112 *lb.* at London make 98 *lb.* at Roan; how many *lb.* at Roan are equal to 1000 *lb.* at London? *Anſw.* 875 *lb.*

3. If 100 Ells Engliſh make 108 Braces at Venice; how many Ells Engliſh are equal to 1000 Braces at Venice? *Anſw.* 925 *Ells* $\frac{100}{108}$.

4. If 100 Ells at London make 145 Ells at Vienna; how many Ells at Vienna are equal to 10 Ells at London? *Anſw.* 14 *Ells* $\frac{1}{2}$.

Note, Hence appears the Reaſon of thoſe Rules, laid down in Conjoin'd Proportion, for placing the laſt Number in the Queſtion either on the right Hand or the left, as the nature of the Queſtion requires.

lb.Liſ. *lb.Lon.* *lb.Liſ.*
Ex. 1. 99 : 112 : : 1049
lb. *lb.*
112 = 99
1049

lb.Lon. *lb.R.* *lb.Lon.*
Ex. 2. 112 : 98 : : 1000
lb. *lb.*
112 = 98
1000

Of the DOUBLE RULE *of* THREE.

Q. BY *what is the Double Rule of Three known?*

A. By five Terms which are always given in the Queſtion to find a Sixth.

Q. *In what Proportion is the ſixth Term to be found?*

A. If the Proportion is Direct, the ſixth Term muſt bear ſuch Proportion to the Fourth and Fifth, as the Third bears to the Firſt and Second: But if the Proportion is Inverſe, then the ſixth Term muſt bear ſuch Proportion to the Fourth and Fifth, as the Firſt bears to the Second and Third, or as the Second bears to the Firſt and Third.

Note, It is to be obſerved here, as in the Single Rule of Three, that Direct Proportion is when more requires more, or leſs requires leſs; and Inverſe Proportion is when more requires leſs, or leſs requires more.

Q. *What do you obſerve concerning the five given Terms?*

A. That the three firſt Terms are a ſuppoſition; the two laſt are a demand.

Q. *How muſt the Numbers given in the Queſtion be ſtated?*

A. By two Single Rules of Three: Or otherwiſe, thus:

1. Let the principal Cauſe of Loſs or Gain, Intereſt, or Decreaſe, Action or Paſſion, be put in the firſt Place.

2. Let that which betokeneth Time, Diſtance of Place, and the like, be put in the ſecond Place, and the remaining one in the third Place.

3. Place the other two Terms under their like in the Suppoſition.

4. If the Blank falls under the third Term, multiply the firſt and ſecond Terms for a Diviſor, and the other three for a Dividend.

5. If the Blank falls under the firſt or ſecond Term, multiply the third and fourth Terms for a Diviſor, and the other three for a Dividend; and the Quotient will be the Anſwer.

Q. *How are the following Queſtions proved?*

A. Let them be varied; or elſe work the ſame Queſtions by two Single Rules of Three.

EXAMPLES.

1. If 7 Men can reap 84 Acres of Wheat in 12 Days; how many Men can reap 100 Acres in 5 Days? *Anſw.* 20 *Men.*

2. If 7 *qrs.* of Malt are ſufficient for a Family of 7 Perſons for 4 Months; how many *qrs.* are enough for 46 Perſons 10 Months? *Anſw.* 115 *qrs.*

3. If 8 Reapers have 3 *l.* 4 *s.* for 4 Days Work; how much will 48 Men have for 16 Days Work? *Anſw.* 76 *l.* 16 *s.*

4. If 10 Buſhels of Oats be enough for 18 Horſes 20 Days; how many Buſhels will ſerve 60 Horſes 36 Days? *Anſ.* 6 *Buſh.*

5. If a Footman travels 240 Miles in 12 Days, when the Days are 12 Hours long; how many Days may he travel 720 Miles in, of 16 Hours long? *Anſw.* 27 *Days.*

6. If 56 *lb.* of Bread will be ſufficient for 7 Men 14 Days, how much Bread will ſerve 21 Men 3 Days? *Anſw.* 36 *lb.*

7. If 700 *l.* in half a Year raiſe 14 *l.* Intereſt; how much will 400 *l.* raiſe in 5 Years? *Anſw.* 80 *l.*

8. If 30 *s.* be the Hire of 8 Men for three Days; how many Days muſt 20 Men work for 15 *l.*? *Anſw.* 12 *Days.*

9. If 4 Reapers have 24 *s.* for 3 Days Work; how many Men will earn 4 *l.* 16 *s.* in 16 Days? *Anſw.* 3 *Men.*

10. An Uſurer put out 86 *l.* to receive Intereſt for the ſame; and when it had continued 8 Months, he received for Principal and Intereſt 88 *l.* 17 *s.* 4 *d.* I demand at what rate *per cent. per annum* he received Intereſt? *Anſw.* 5*l. per cent.*

11. What is the Intereſt of 200 *l.* for 3 Years and $\frac{3}{4}$, at 5 *per cent. per annum*? *Anſw.* 37 *l.* 10 *s.*

12. What is the Intereſt of 400 *l.* for a Week, at 5 *per cent. per annum*? *Anſw.* 7 *s.* 8 *d.* 1 *qr.*$\frac{12}{52}$

13. What is the Intereſt of 120 *l.* for 126 Days, at 4 *per cent. per annum*? *Anſw.* 1 *l.* 13 *s.* 1 *d.* 2 *qrs.*$\frac{258}{365}$.

Note, The Rule for working Queſtions in Simple Intereſt for Days, p. 67, is taken from this Rule, as appears from this laſt Example.

Of CONJOIN'D PROPORTION.

Q. *What is Conjoin'd Proportion?*

A. Conjoin'd Proportion is when the Coins, Weights, or Meaſures of ſeveral Countries are compared in the ſame Queſtion; or it is a linking together of many Proportions.

CASE I.

Q. *How are the Queſtions anſwered in this Caſe?*

A. When it is required to know how many of the firſt ſort of Coin, Weight or Meaſure mentioned in the Queſtion, are equal to a given Number of the laſt; then

1. Place the Numbers alternately, beginning at the left Hand, and let the laſt Number ſtand on the left Hand.

2. Multiply the firſt Rank continually for a Dividend, and the ſecond for a Diviſor.

Note, See the Note in Compariſon of Weights and Meaſures, p. 91. for the Reaſon of this Rule.

Q. *How is Conjoin'd Proportion proved?*

A. Make as many Single Rules of Three as the Nature of the Queſtion requires.

EXAMPLES.

1. If 100 *lb.* Engliſh make 95 *lb.* Flemiſh; and 19 *lb.* Flemiſh 25 *lb.* at Bolonia; how many *lb.* Engliſh are equal to 50 *lb.* at Bolonia? *Anſw.* 40 *lb. Engliſh.*

2. If 25 *lb.* at London be 22 *lb.* at Nurenburgh; 88 *lb.* at Nurenburgh 92 *lb.* at Hamburgh; 46 *lb.* at Hamburgh 49 *lb.* at Lyons; how many *lb.* at London are equal to 98 *lb.* at Lyons? *Anſw.* 100 *lb.*

3. If 6 Braces at Leghorn make 3 Ells Engliſh; 5 Ells Engliſh 9 Braces at Venice; how many Braces at Leghorn will make 45 Braces at Venice? *Anſw.* 50 *Braces at Leghorn.*

4. If 3 Ells Engliſh make 6 Braces at Leghorn; and 150 Braces at Leghorn 135 Braces at Venice; how many Ells Engliſh are equal to 27 Braces at Venice? *Anſw.* 15 *Ells Engliſh.*

CASE 2.

Q. *How are Queſtions anſwered in this Caſe?*

A. When it is required to know how many of the laſt ſort of Coin, Weight or Meaſure, mentioned in the Queſtion are equal to a given number of the firſt; then

1. Place the Numbers alternately, as in Caſe 1, but let the laſt Number ſtand on the right Hand.

2. Multiply the ſecond Rank for a Dividend, and the firſt for a Diviſor.

EXAMPLES.

1. If 10 *lb.* at London make 9 *lb.* at Amſterdam; 90 *lb.* at Amſterdam 112 *lb.* at Thoulouſe: how many *lb* at Thoulouſe are equal to 50 *lb.* at London? *Anſw.* 56 *lb. at Thoulouſe.*

2. If 20 Braces at Leghorn be equal to 10 Vares at Liſbon; 40 Vares at Liſbon to 80 Braces at Lucca; how many Braces at Lucca are equal to 100 Braces at Leghorn? *Anſw.* 100 *Braces at Lucca.*

Of ALLIGATION.

Q. HOW *many kinds of Alligation are there?*

A. Two: Alligation Medial, and Alligation Alternate.

Of ALLIGATION MEDIAL.

Q. *What is Alligation Medial?*

A. Alligation Medial is when the Quantities and Prices of ſeveral things are given to find the mean Price of the Mixture compounded of thoſe things.

Q. *What is the Rule?*

A. As the whole Compoſition,
Is to its Total Value:
So is any Part of the Compoſition,
To its mean Price.

Q. *How is Alligation Medial proved?*

A. Find the Value of the whole Mixture at the mean Rate; and if it agrees with the Total Value of the ſeveral Quantities, at their reſpective Rates, the Work is right.

EXAMPLES.

1. A Farmer mingled 19 Buſhels of Wheat at 6 *s. per* Buſhel, and 40 Buſhels of Rye, at 4 *s. per* Buſhel, and 12 Buſhels of Barley, at 3 *s. per* Buſhel together: I demand what a Buſhel of this mixture is worth? *Anſw.* 4 *s.* 4 *d.* 1 *qr.* $\frac{41}{71}$.

2. A Farmer mingled 20 Buſhels of Oats, at 2 *s. per* Buſhel, and 30 Buſhels of Beans, at 2 *s. per* Buſhel, and 20 Buſhels of Peas, at 3 *s. per* Buſhel together; I demand the Worth of a Buſhel of this Mixture? *Anſw.* 2 *s*, 3 *d.* 1 *qr.* $\frac{5}{7}$.

3. A Vintner mingled 5 Gallons of Canary, at 8 *s. per* Gallon, and 6 Gallons of Malaga, at 7 *s. per* Gallon, and 4 Gallons of white Wine, at 6 *s. per* Gallon together; I demand what a Gallon of this mixture is worth? *Anſw.* 7 *s.* 0 *d.* 3 *qrs.* $\frac{1}{5}$

4. A Grocer mingled 2 *C.* of Sugar, at 56 *s. per C.* and 1 *C.* at 43 *s. per C.* and 2 *C.* at 50 *s. per C.* together; I demand the price of 3 *C.* of this mixture? *Anſw.* 7 *l.* 13 *s.*

5. An Alehouſe keeper mixed 3 ſorts of Ale together, *viz.* 12 Gallons at 6 *d. per* Gallon, 16 Gallons, at 7 *d. per* Gallon, and 21 Gallons, at 9 *d. per* Gallon; I demand what 1 Gallon of this mixture is worth? *Anſw.* 7 *d.* 2 *qrs* $\frac{22}{49}$.

6. A Refiner having 5 *lb.* of Silver Bullion, of 8 *oz.* fine, 10 *lb.* of 7 *oz.* fine, and 15 *lb.* of 6 *oz.* fine, would melt all together; I demand what Fineneſs 1 *lb.* of this Maſs ſhall be? *Anſw.* 6 *oz.* 13 *dwts.* 8 *gr. fine.*

7. A Mint Maſter having 3 *lb.* Weight of Gold, of 22 Carats fine, and 3 *lb.* of 20 Carats fine; I demand what Fineneſs an *oz* of this mixture will bear? *Anſw.* 21 *Carats fine.*

8. An Hoſtler mixing Provender for his Horſes, would put in a Quantity of Beans, at 5 *s. per* Buſhel, with the like Quantity of Oats, at 3 *s.* 6 *d. per* Buſhel; I demand the Price of a Buſhel of this Mixture? *Anſw.* 4 *s.* 3 *d.*

9. A Maltſter hath ſeveral ſorts of Malt, *viz.* one ſort at 4 *s.* 6 *d.* another at 4 *s.* and a third at 3 *s.* 6 *d. per* Buſhel, and he would mix an equal Quantity of each together; I demand the Price of a Buſhel of this mixture? *Anſw.* 4 *s.*

10. A Brewer had ſeveral ſorts of Ale, *viz* one ſort at 20 *s. per* Barrel; another at 25 *s.* a third at 30 *s.* and a fourth at 35 *s. per* Barrel; and he would mix an equal Quantity of each together; I demand the Price of a Barrel, and alſo of a Gallon of this Mixture? *Anſw.* 27 *s.* 6 *d. per Barrel,* and 10 *d.* 1 *qr* $\frac{8}{32}$ *per Gallon.*

Of ALLIGATION ALTERNATE.

Q. *What is Alligation Alternate?*

A. Alligation Alternate is, when the Rates of ſeveral things are given to find ſuch Quantities of them, as are neceſſary to make a mixture which may bear a certain Rate propounded.

Q. *How are Rates or Prices of the given things to be ordered?*

A. 1. They muſt be placed one over the other, and the propounded Price of the compoſition againſt them; thus,

$$\textit{Mean Rate } 7 \left\{ \begin{array}{ll} 4 & \textit{Prices} \\ 5 & \textit{of the} \\ 6 & \textit{Sim-} \\ 8 & \textit{ples.} \end{array} \right.$$

2. Link the ſeveral Rates together, in ſuch ſort, that one greater than the mean Rate may be coupled to another which is leſs.

3. Take the differences between the mean Rate, and the ſeveral Prices, and place them each againſt his Yoke-fellow: And for the reſt, obſerve the following Caſes.

CASE 1.

Q. *What do you obſerve in this firſt Caſe?*

A. When the prices of the ſeveral things together with the mean Rate of the mixture are given, without any Quantity, to find how much of each Ingredient is required to compoſe the Mixture; take the differences between each price, and the mean Rate, and ſet them alternately, and they will be the Quantities required.

Q. *How are the Operations in this and the following Caſes proved?*

A. They are all proved by Alligation Medial.

EXAMPLES.

1. How much Rye at 4 *s. per* Buſhel, Barley at 3 *s. per* Buſhel, and Oats at 2 *s. per* Buſhel, will make a mixture worth 2 *s.* 6 *d. per* Buſhel? *Anſw.* 6 *Buſhels of Rye,* 6 *Buſhels of Barley, and* 24 *Buſhels of Oats.*

2. How many Raiſins of the Sun, at 7 *d. per lb.* and Malaga Raiſins at 4 *d. per lb.* may be mixed together for 6 *d. per lb*? *Anſw.* 2 *lb. of Raiſins of the Sun, and* 1 *lb. of Malaga Raiſins.*

Note, Queſtions in this Rule do frequently admit of an infinite variety of Anſwers, and all in whole Numbers; as in this laſt Example; where tho' 2 and 1 do anſwer the Queſtion, yet any other two Numbers will as truly do the like, that are in the ſame proportion.

For 2 : 1 : :	4	:	2
	6	:	3
	8	:	4
	16	:	8
	40	:	20, &c. *without end.*

3. A Grocer would mix three ſorts of Sugar together, *viz.* one ſort at 10 *d. per lb* another at 7 *d.* and another at 6 *d.* how much of each ſort muſt he take, that the whole mixture may be ſold for 8 *d. per lb*?

lb. d. lb. d. lb. d.
Anſw. 3 *at* 10 : 2 *at* 7, *and* 2 *at* 6 *per lb.*

4. A Maltſter hath ſeveral ſorts of Malt, *viz.* one ſort at 4 *s. per* Buſhel, another at 3 *s.* 6 *d.* a third at 3 *s.* and a fourth at 2 *s. per* Buſhel; and he is deſirous to mix ſo much of each ſort together, that the whole may be ſold at 2 *s.* 6 *d. per* Buſhel; I demand how much he muſt take of each ſort?

Buſh. s. B. s. d. B. s. B. s.
Anſw 6 *at* 4; 6 *at* 3 6; 6 *at* 3, *and* 36 *at* 2 *per Buſhel.*

5. A Druggiſt hath ſeveral ſorts of Tea, *viz* one ſort at 12 *s. per lb.* another at 11 *s.* a third at 9 *s.* and a fourth at 8 *s. per lb.* I demand how much of each ſort he muſt mix together, that the whole Quantity may be afforded at 10 *s. per lb*?

	lb.		*s.p.lb.*		*lb.*		*s p lb.*		*lb.*		*s.p.lb.*
1 *Anſw.*	2	at	12	2 *Anſw.*	3	at	12	3 *Anſw.*	1	at	12
	1	at	11		2	at	11		2	at	11
	1	at	9		2	at	9		2	at	9
	2	at	8		3	at	8		1	at	8

	lb.		*s.p lb.*		*lb.*		*s p.lb.*		*lb*		*s.p.lb.*
4 *Anſw.*	1	at	12	5 *Anſw.*	3	at	12	6 *Anſw.*	2	at	12
	3	at	11		1	at	11		3	at	11
	3	at	9		3	at	9		1	at	9
	1	at	8		2	at	8		3	at	8

7 *Anſw.* 3 *lb. of each ſort.*

Note, Theſe ſeven Anſwers ariſe from as many different ways of linking the Rates of the Simples together.

6. How much Alloy muſt I mix with Bullion of 10 *oz.* fine, to abaſe the ſame to 8 *oz.* fine? *Anſw. To every* 8 *oz. of Bullion of* 10 *oz. fine, put* 2 *oz. of Alloy, and that will abaſe it to* 8 *oz. fine.*

CASE 2.

Of Alternation Partial.

Q. *What do you obſerve in this ſecond Caſe?*

A. When the Rates of all the things, the Quantity of but one of them, and the mean Rate of the whole mixture are given, to find the ſeveral Quantities of the reſt, in Proportion to the Quantity given; take the difference between each price, and the mean Rate, and place them alternately, as in Caſe 1. Then ſay,

As the difference of the ſame Name with the Quantity given,
Is to the reſt of the Difference ſeverally:
So is the Quantity given,
To the ſeveral Quantities required.

EXAMPLES.

1. A Man being determined to mix 10 Buſhels of Wheat at 4 *s. per* Buſhel, with Rye at 3 *s.* with Barley at 2 *s.* and with Oats, at 1 *s per* Buſhel; I demand how much Rye, Barley, and Oats, muſt be mixed with the 10 Buſhels of Wheat, that the whole may be ſold at 28 *d per* Buſhel?

1 *Anſw.*
B. p.
2 2 *of Rye*
5 0 *of Barley.*
12 2 *of Oats.*

2 *Anſw.*
B.
40 *of Rye*
50 *of Barley*
20 *of Oats*

3 *Anſw.*
B
8 *of Rye*
10 *of Barley*
14 *of Oats.*

4 *Anſw.*
B.
10 *of Rye*
14 *of Barley*
14 *of Oats*

5 *Anſw.*
B. p.
12 2 *of Rye*
5 0 *of Barley*
17 2 *of Oats*

6 *Anſw.*
B.
2 *of Rye*
14 *of Barley*
10 *of Oats*

7 *Anſw.*
B.
50 *of Rye*
70 *of Barley*
20 *of Oats*

2. A Man being determined to mix 12 Buſhels of Oats, at 18 *d. per* Buſhel, with Barley at 2 *s.* 6 *d.* with Rye at 3 *s.* and with Wheat at 4 *s. per* Buſhel; I demand how much Barley, Rye and Wheat, muſt be mixed with the 12 Buſhels of Oats,

that it may bear the price of 22 *d. per* Buſhel? *Anſw.* 1 *Buſhel of each ſort.*

3. A Man being determined to mix 12 Buſhels of Oats, at 18 *d. per* Buſhel, with Barley at 2 *s.* 6 *d.* with Rye at 3 *s.* and with Wheat at 4 *s. per* Buſhel; I demand how much Barley, Rye, and Wheat muſt be mixed with the 12 Buſhels of Oats, that the whole may bear the Price of 2 *s.* 9 *d. per* Buſhel?

1 *Anſw.*
B.
60 *of Barley*
60 *of Rye*
12 *of Wheat*

2 *Anſw.*
B. *p.*
2 $1\frac{9}{15}$ *of Barley*
2 $1\frac{9}{15}$ *of Rye*
12 0 *of Wheat*

3 *Anſw.*
B.
10 *of Barley*
10 *of Rye*
12 *of Wheat*

4 *Anſw.*
B.
72 *of Barley*
72 *of Rye*
12 *of Wheat*

5 *Anſw.*
B.
12 *of Barley*
12 *of Rye*
10 *of Wheat*

6 *Anſw.*
B. *p.*
14 $1\frac{9}{15}$ *of Barley*
2 $1\frac{9}{15}$ *of Rye*
14 $1\frac{9}{15}$ *of Wheat*

7 *Anſw.* 12 *Buſhels of each ſort.*

4. A Man being determined to mix 12 Buſhels of Oats, at 18 *d. per* Buſhel, with Barley at 2 *s.* 6 *d.* with Rye at 3 *s.* and with Wheat at 4 *s. per* Buſhel; I demand how much Barley, Rye, and Wheat, muſt be mixed with the 12 Buſhels of Oats, that the whole Quantity may bear the Price of 3 *s.* 6 *d. per* Buſhel?

Anſw.
B.
12 *of Barley*
12 *of Rye*
84 *of Wheat*

5. A Man intends to mix 28 Buſhels of Oats, at 18 *d per* Buſhel, with Barley at 2 *s* 6 *d.* with Rye at 3 *s.* and with Wheat at 4 *s.* I would know how much Barley, Rye, and Wheat, ought to be added to the 28 buſhels of Oats, that the whole Quantity may be afforded at 2 *s. per* Buſhel? *Anſw.* 4 *Buſhels of each ſort.*

6. A Farmer would mix 27 Buſhels of Peaſe, at 18 *d. per* Buſhel, with Oats at 28 *d.* and with Beans at 30 *d. per* Buſhel, that the whole Quantity may bear the price of 20 *d. per* Buſhel, I demand how much Oats and Beans muſt be mixed with the 27 Buſhels of Peaſe? *Anſw.* 3 *Buſhels of each ſort.*

CASE 3.

Of Alternation Total.

Q. *What do you obſerve in this third Caſe?*

A. When the Rates of the ſeveral things, the Quantity to be compounded, and the mean Rates of the whole Mixture are given, to find how much of each ſort will make up the Quantity; place the Differences between the ſeveral Prices, and the mean Rates, alternately, as in Caſe 1. Then ſay,

As the Sum of the Difference,
Is to the whole Compoſition;
So is the Difference of each Rate,
To the Quantity of the ſame Rate.

EXAMPLES.

1. A Grocer hath 4 ſorts of Sugar, *viz.* at 8 *d. per lb.* at 6 *d. per lb.* at 4 *d. per lb.* and at 2 *d. per lb.* and he would have a Compoſition of an *C. wt.* worth 5 *d. per lb.* I demand how much of each ſort he muſt take?

1 *Anſw.*

lb.	*d.p.lb.*
42	at 8
14	at 6
14	at 4
42	at 2
112	

2 *Anſw.*

lb.	*d.p.lb.*
14	at 8
42	at 6
42	at 4
14	at 2
112	

3 *Anſw.*

lb.	*oz.*	*dr.*	*d p.lb.*
28	0	0	at 8
37	5	$5\frac{4}{12}$	at 6
9	5	$5\frac{4}{12}$	at 4
37	5	$5\frac{4}{12}$	at 2
112	0	0	

4 *Anſw.*

lb.	*oz.*	*dr.*	*d p.lb.*
37	5	$5\frac{4}{12}$	at 8
9	5	$5\frac{4}{12}$	at 6
37	5	$5\frac{4}{12}$	at 4
28	0	0	at 2
112	0	0	

5 *Anſw.*

lb.	*oz.*	*dr.*	*d p.lb.*
11	3	$3\frac{2}{10}$	at 8
44	12	$12\frac{8}{10}$	at 6
44	12	$12\frac{8}{10}$	at 4
11	3	$3\frac{2}{10}$	at 2
112	0	0	

6 *Anſw.*

lb.	*d.p.lb.*
32	at 8
24	at 6
24	at 4
32	at 2
112	

7 *Anſw.* 28 *lb. of each ſort.*

2. A Vintner hath 4 ſorts of Wine, *viz.* Canary at 20 *s. per* Gallon, Malaga at 8 *s.* Rheniſh at 6 *s.* and Oporto at 4 *s.* and he is minded to make a Compoſition of 60 Gallons, worth 9 *s. per* Gallon; I demand how much of each ſort he muſt have? *Anſw.* 45 *Gals of Canary, and* 5 *Gals. of each other ſort.*

3. A Brewer hath 3 ſorts of Ale, *viz.* at 10 *d.* at 8 *d.* and at 6 *d. per* Gallon; and he would have a Compoſition of 30 Gallons, worth 7 *d. per* Gallon; I demand how much of each ſort he muſt have?

Anſw.
Gals. d per Gallon.
5 at 10
5 at 8
20 at 6
—
30
—

4. A Goldſmith hath ſeveral ſorts of Gold, *viz.* ſome of 24 Carrats fine, ſome of 22 Carrats, and ſome of 18 Carrats fine; and he would have compounded of theſe ſorts the Quantity of 60 *oz.* of 20 Carrats fine; I demand how much of each ſort he muſt take?

Anſw.
oz.
12 at 24 *Carrats fine.*
12 at 22 *Carrats fine.*
36 at 18 *Carrats fine.*
—
60
—

5. A Goldſmith hath Gold of 3 ſorts, *viz.* of 22 Carrats, of 21 Carrats, and of 20 Carrats fine, and he would mix with theſe ſo much Alloy, as that the Quantity of 21 *oz.* may bear 18 Carrats fine; I demand how much of each ſort he muſt take, and how much Alloy? *Anſw.* 6 *oz. of each ſort of Gold, and* 3 *oz. of Alloy.*

6. A Druggiſt hath three ſorts of Drugs, one was worth 4 *s. per lb.* another 5 *s.* and another 8 *s.* and out of theſe he made two Parcels, one was 21 *lb.* at 6 *s. per lb.* and the other 35 *lb.* at 7 *s. per lb.* how much of every ſort did he take for each parcel?

	lb.	*s. per lb,*	*lb.*	*s. per lb.*
Anſw.	6 at	4	5 at	4
	6 at	5	5 at	5
	9 at	8	25 at	8
	—		—	
	21 at	6 *s. per lb.*	35 at	7 *s. per lb.*

Of

Of POSITION.

Q. W*HAT is Poſition or Negative Arithmetic?*

A. It diſcovers the Truth by ſuppoſed Numbers.

Q. *How many kinds of Poſition are there?*

A. Two: Single and Double.

Of SINGLE POSITION.

Q. *What is Single Poſition?*

A. It diſcovers the Truth by only one ſuppoſed Number.

Q. *How is that ſuppoſed Number uſed?*

A. By working with it, as if it was the true Number, in the ſame Proportion as the Queſtion directs; and if the Reſult be either too much, or too little, the true Number may be found out by the following Rule, *viz.*

As the Reſult of the Poſition,
Is to the Poſition:
So is the given Number,
To the Number required.

Q. *How do you prove Poſition?*

A. Poſition, both Single and Double, is proved by adding the ſeveral Sums required, or the ſeveral Parts of the Sum required together; and if that Sum agrees with the given Sum, it is right.

EXAMPLES.

1. Two Men, *A* and *B*, having found a Bag of Money, diſputed who ſhould have it; *A* ſaid the half, third and fourth of the Money made 130 *l.* and if *B* could tell how much was in it, he ſhould have it all, otherwiſe he ſhould have nothing; I demand how much was in the Bag? *Anſw.* 120 *l.*

2. *A*, *B*, and *C*, determining to buy together a certain Quantity of Timber, worth 36 *l.* agree that *B* ſhall pay $\frac{1}{3}$ more than *A*, and *C* $\frac{1}{4}$ more than *B*; I demand how much each Man muſt pay? *Anſw.* A 9 *l.* B 12 *l.* C 15 *l.*

3. A Perſon having about him a certain Number of Crowns, ſaid, if the half, third and fourth of them were added together, they would make 65 Crowns; I demand how many he had? *Anſw.* 60 *Crowns.*

4. *A* lent *B* a ſum of Money, to be paid at 4 payments; when 3 of them were made, and *A* came to demand the fourth, *B* would give him no more, except he would tell him how much was paid already; *A* ſaid the firſt Payment was a fourth; the ſecond, a fifth; and the third, a ſixth of the Sum firſt lent: and all together made 74*l.* I demand the ſum lent? *Anſw.* 120*l.*

5. One Man carrying a Bag of Money in his hand, another aſked him how much was in it: He anſwered, he could not tell; but the third, fourth, and fifth made 94 *l.* How much was in the Bag? *Anſw.* 120 *l.*

6. I have delivered to a Banker a certain Sum of Money, to receive of him after the Rate of 6 *l. per cent. per annum;* and at the end of ten Years, he paid me 500 *l.* for Principal and Intereſt together; I demand the Sum delivered to him at firſt? *Anſw.* 312 *l.* 10 *s.*

Of DOUBLE POSITION.

Q. *What is Double Poſition?*

A. It is that which diſcovers the true Number ſought, by making uſe of two ſuppoſed Numbers.

Q. *How are thoſe ſuppoſed Numbers uſed?*

A. 1. By working with them as if they were the true Numbers, in the ſame proportion as the queſtion directs.

2. The Reſults or Errors muſt be placed againſt their Poſitions, or ſuppoſed Numbers; thus.

3. Multiply them Croſs-wiſe.

Pos.	*Er.*
40	28
36	19

4. If the Errors are alike; *i. e.* both greater, or both leſs than the given Number, take their difference for a Diviſor, and the difference of the Products for a Dividend.

5. If the Errors are unlike, take their Sum for a Diviſor, and the Sum of the Products for a Dividend; the Quotient thence ariſing will be the Anſwer.

EXAMPLES.

1. *A*, *B*, and *C*, would divide 100 *l.* between them, ſo as that *B* may have 3 *l.* more than *A*, and *C* 4 *l.* more than *B*; I demand how much each Man muſt have? *Anſw.* A 30 *l.* B 33 *l.* C 37 *l.*

2. A Man lying at the Point of Death, ſaid, he had in a certain Coffer 100 *l.* which he bequeathed to 3 of his friends after this Manner: The firſt muſt have a certain Portion; the ſecond muſt have twice as much as the firſt, wanting 8 *l.* and the third muſt have three times as much as the firſt, wanting 15 *l.* I demand how much each Man muſt have? *Anſw. The firſt* 20 *l.* 10 *s. ſecond* 33 *l. third* 46 *l.* 10 *s.*

3. *A*, *B*, and *C*, built an Houſe, which coſt 100 *l.* of which *A* paid a certain Sum; *B* paid 10 *l.* more than *A*, and *C* paid as much as *A* and *B*; I demand each Man's ſhare in that Charge? *Anſw.* A *paid* 20 *l*, B 30 *l.* C 50 *l.*

4. Three Perſons diſcourſed together concerning their ages; ſays *A*, I am 20 Years of Age ; ſays *B*, I am as old as *A*, and half *C* ; and ſays *C*, I am as old as you both : I demand the age of each Perſon ? *Anſw.* A *was* 20, B 60, C 80 *Years of age.*

5. A Man lying at the Point of Death, left to his 3 Sons all his Eſtate in Money, *viz.* to *F* half wanting 50*l.* to *G* one third; and to *H* the reſt, which was 10 *l.* leſs than the Share of *G*; I demand the Sum left, and each Man's Part ? *Anſw. The Sum left was* 360 *l. whereof* F *had* 130 *l.* G 120 *l.* H 110 *l.*

6. A certain Man having drove his Swine to the Market, *viz.* Hogs, Sows, and Pigs, received for them all 50 *l.* being paid for every Hog 18 *s.* for every Sow 16 *s.* for every Pig 2 *s.* there were as many Hogs as Sows, and for every Sow there were three Pigs ; I demand how many there were of each ſort ? *Anſw.* 25 *Hogs*, 25 *Sows*, 75 *Pigs.*

7. A ſurly old fellow being demanded the Ages of his four Children, anſwer'd, You may go and look : But if you muſt needs know ; my firſt Son was born juſt one Year after I was married to his Mother, who, after his Birth, lived 5 Years, and then died in Child-bed with my ſecond Son : 4 Years after that I married again, and within 2 Years had my third and fourth Sons at a Birth ; the Sum of whoſe two ages is now equal to that of the eldeſt : I demand their ſeveral ages? *Anſw. The firſt Son was* 22 *Years old, the ſecond* 17, *the third* 11 *and the fourth* 11 *Years old.*

Of COMPARATIVE ARITHMETIC.

Q. W*HAT is Comparative Arithmetic ?*

A. It is ſuch as anſwers Queſtions by Numbers, having Relation one to another.

Q. *Wherein does this Relation conſiſt ?*

A. It conſiſts either in Quantity or Quality.

Q. *What is Relation of Numbers in Quantity ?*

A. It is the Reſpect that one Number has to another.

Q. *How many are the Numbers propounded ?*

A. They are always two, the Antecedent and the Conſequent.

Q. *In what does Relation of Numbers in Quantity conſiſt ?*

A. It conſiſts in the Difference, or elſe in the Rate or Reaſon that is found between the Terms propounded.

Note, The Difference of any two Numbers is the Remainder ; but the Rate or Reaſon is the Quotient of the Antecedent divided by the Conſequent.

Q. *What is Relation of Numbers in Quality or Progreſſion?*

A. Progreſſion or Proportion is the reſpect that the Reaſon of Numbers have one to another.

Q. *How many muſt the Terms be?*

A. Three or more, but never leſs: Becauſe leſs than three will not admit of a Compariſon of Reaſons or Differences.

Of PROGRESSION.

Q. *How many kinds of Progreſſion are there?*

A. Two: Arithmetical and Geometrical.

Of ARITHMETICAL PROGRESSION.

Q. *What is Arithmetical Progreſſion?*

A. Arithmetical Progreſſion is when ſeveral Numbers have equal Differences; as 1,2,3,4, differ by 1; or 2,4,6, differ by 2.

Note 1. If any Number of Terms differ by Arithmetical Progreſſion, the Sum of the two Extremes will be equal to the Sum of any two Means equally diſtant from the Extremes As in 2, 4, 6, 8; where 2 + 8 are = 4 + 6 = 10, and ſo of any larger Number of Terms.

2. If the Number of Terms be odd, the middlemoſt ſupplies the Place of two Terms. As in 1, 2, 3; where 1 + 3 are=2 + 2=4.

CASE 1.

Q. *What do you obſerve in this firſt Caſe?*

A. When the two Extremes, and the Number of Terms in any Series of Numbers in Arithmetical Progreſſion are given, and the Sum of all the Terms required, then multiply the Sum of the two Extremes by half the Number of Terms; Or,

Multiply half the Sum of the Extremes by the whole Number of Terms, the Product is the Total of all the Terms.

EXAMPLES.

1. How many Strokes does the Hammer of a Clock ſtrike in 12 Hours? *Anſw.* 78.

2. A Merchant hath ſold 100 Yards of ſuperfine Cloth, *viz.* the firſt Yd. for 1*s.* the ſecond for 2*s.* the third for 3*s.* *&c.* I demand how much he received for the ſaid Cloth? *Anſw.* 252*l.* 10*s.*

3. Bought 19 Yds. of Shalloon, and gave 1*d.* for the firſt Yd.; 3*d* for the ſecond, 5*d* for the third, *&c.* increaſing 2*d.* every Yd.; I demand what I gave for the 19 Yards. *Anſw.* 1*l* 10*s.* 1*d.*

4. A Mercer ſold 20 Yds. of Silk, at 3*d.* for the Yd. 6*d.* for the ſecond, 9*d* for the third, *&c.* increaſing 3*d.* every Yd.; I demand what he ſold the 20 Yds. for? *Anſw.* 2*l.* 12*s.* 6*d.*

5. A Butcher bought 100 Head of Cattle, *viz* Oxen, and gave for the firſt Ox 1 Crown, for the ſecond Ox 2 Crowns, for the third Ox 3 Crowns, *&c.* I demand what the Cattle coſt him? *Anſw.* 1262*l.* 10*s.*

6. Admit 100 Stones were laid 2 Yards diſtant from each other in a right line, and a Baſket placed 2 Yards from the firſt Stone; I demand how many Miles a Man ſhall go in gathering them ſingly into the Baſket? *Anſw.* 11 Miles, 3 Furlongs, 180 Yards.

7. A Merchant ſold 1000 Yards of Linen at 2 Pins for the firſt Yard, 4 for the ſecond, 6 for the third, *&c.* increaſing 2 Pins, for every Yard; I demand how much the Linen produced when the Pins were afterwards ſold at 12 for a Farthing? Alſo whether the ſaid Merchant gained or loſt by the Sale thereof, and how much, ſuppoſing the ſaid Linen to have been bought at 6*d per* Yard.

Anſw. { *The Linen produced* 86*l.* 17*s.* 10.
The Merchant gained 61 17 10.

CASE. 2.

Q. *What do you obſerve in this ſecond Caſe?*

A. When the two Extremes, and the Number of Terms in any Series of Numbers in Arithmetical Progreſſion are given, and the common Difference of all the Terms in that Series are required, then

Divide the Difference between the two Extremes, by the Number of Terms, leſs one; the Quotient will be the common Difference.

EXAMPLES.

2. There are 21 Men, whoſe Ages are equally diſtant from each other in Arithmetical Progreſſion: the Youngeſt is 20 Years old, and the Eldeſt is 60; I demand the common Difference of their Ages, and the Age of each Man? *Anſw. The common Difference is two Years; therefore,*

Years.
60 *is the Age of the firſt Man.*
60—2=58 *is the Age of the Second.*
58—2=56 *is the Age of the Third.*
56—2=54 *is the Age of the Fourth,* &c.

2. A Debt is to be diſcharged at 16 ſeveral Payments in Arithmetical Proportion; the firſt Payment is to be 14*l.* the laſt 100*l.* what is the whole Debt, and what muſt each Payment be? *Anſw. The whole Debt is* 912*l. The common Difference is* 5*l.* 14*s.* 8*d. therefore,*

14*l.* 0*d.* 0*d.* 1*ſt. Payment.*
14*l* 0*s.* 0*d* + 5*l.* 14*s.* 8*d.* = 19 14 8 2*d.*
19 14 8 + 5 14 8 = 25 9 4 3*d.*
25 9 4 + 5 14 8 = 31 4 0 4*th,* &c.

3. A Man is to travel from York to a certain Place in 12 Days, and to go but three Miles the firſt Day, increaſing every Day's Journey by an equal Exceſs, ſo that the laſt Day's Journey may be 36 Miles; what will each Day's Journey be, and how many Miles is the Place he goes to diſtant from York?

Anſw. The common Difference is 3; *therefore,*

Miles.
3 *is the firſt Day's Journey.*
3 + 3 = 6 *is the Second.*
6 + 3 = 9 *is the Third.*
9 + 3 = 12 *is the Fourth,* &c.
The whole Diſtance is 234 *Miles.*

4. A running Footman, on a Wager, is to travel from London Northward, as follows; that is to ſay, he is to go 4 Miles the firſt Day; and 40 Miles the laſt Day; and to go the whole Journey in 10 Days, increaſing every Day's Journey by an equal Exceſs; I demand the Number of Miles he travelled each Day, and the Length of the whole Journey?

Anſw. The common Difference is 4; *therefore,*

Miles.
4 *is the firſt Day's Journey.*
4 + 4 = 8 *is the Second.*
8 + 4 = 12 *is the Third,* &c.
The whole Journey 220 *Miles.*

Of GEOMETRICAL PROGRESSION.

Q. *What is Geometrical Progreſſion?*

A. When any Rank or Series of Numbers increaſes by one common Multiplier, or decreaſes by one common Diviſor, thoſe Numbers are continued in Geometrical Progreſſion; as 3, 6, 12, 24, increaſe by the Multiplier 2; and 24, 12, 6, 3, decreaſe by the Diviſor 2.

Note 1. If any Number of Terms be continued in Geometrical Progreſſion, the Product of the two Extremes will be equal to the Product of any two Means equally diſtant from the Extremes; as in 3, 6, 12, 24; where 3 + 24, are = 6 + 12, = 72; and ſo of any larger Number of Terms.

2. If the Number of Terms be odd, the Middlemoſt ſupplies the Place of two Terms; as in 3, 6, 12; where 3 + 12 are = 6 + 6 = 36.

3. The common Multiplier, and the common Diviſor, are called Ratios.

Q. *How is the Sum of any Series in Geometrical Progreſſion obtained?*

A. When all the Terms alone are given, then from the Product of the ſecond and laſt Terms ſubtract the Square of the firſt Term: that Remainder being divided by the ſecond Term leſs the firſt, will give the Sum of all the Terms.

2. When the two Extremes and the Ratio are only given, then multiply the laſt Term into the Ratio, and from that Product ſubtract the firſt Term: that Remainder divide by the Ratio leſs an Unit or 1, the Quotient is the Sum of all the Terms.

Note 1. As the laſt Term in a long Series of Numbers is very tedious to come at by continual Multiplication: it would be neceſſary for the readier finding it out, to have a Series of Numbers in Arithmetical Proportion, called Indices, beginning with an Unit, whoſe common difference is One: Alſo whatſoever Number of Indices you make choice of, let as many Numbers (in ſuch Geometrical Proportion as are given in the Queſtion) be placed under them.

Thus, { 1, 2, 3, 4, 5, 6, 7. Indices.
2, 4, 8, 16, 32, 64, 128, Numbers in Geometrical Proportion.

2. But if the firſt Term in Geometrical Proportion be different from the Ratio, the Indices muſt begin with a Cypher.

Thus, { 0, 1, 2, 3, 4, 5, 6, Indices.
1, 2, 4, 8, 16, 32, 64, Numbers in Geometrical Proportion.

3. When the Indices begin with a Cypher, the Sum of the Indices made choice of, muſt always be one leſs than the Number of Terms given in the Queſtion: becauſe 1 in the Indices ſtands over the ſecond Term, and 2 in the Indices ſtands over the third Term, &c.

4. Add any two of theſe Indices together, and that Sum will directly correſpond with the Product of their reſpective Terms.

5. By the Help of theſe Indices, and a few of the firſt Terms, in any Series of Geometrical Progreſſion, any Term whoſe diſtance from the firſt Term is aſſigned, though it were never ſo far, may ſpeedily be obtained, without producing all the Terms.

EXAMPLES.

1. A Man bought a Horſe, and by Agreement was to give a Farthing for the firſt Nail, two for the Second, four for the Third, *&c.* there were 4 Shoes, and 8 Nails in each Shoe: I demand what the Horſe was worth at that Rate? *Anſw.* 4473924*l.* 5*s.* 3*d* 3*qrs.*

2. A Merchant ſold 15 Yards of Sattin, the firſt Yard for 1*s*, the ſecond for 2*s.* the third for 4*s.* the fourth for 8*s.* *&c.* I demand the Price of the 15 Yards? *Anſw.* 1638*l.* 7*s.*

3. A Draper ſold 20 Yards of ſuperfine Cloth, the firſt Yard for 3*d.* the ſecond for 9*d.* the third for 27*d.* *&c.* in triple Proportion Geometrical; I demand the Price of the Cloth? *Anſw.* 21792402*l.* 10*s*,

4. A Goldſmith ſold 1 *lb.* of Gold at a Farthing for the firſt Ounce, a Penny for the ſecond, 4*d.* for the third, *&c.* in quadruple Proportion Geometrical; I demand what he ſold the Whole for; alſo how much he gained by the Sale thereof, ſuppoſing he gave for it 4*l. per* Ounce.

Anſw.	*He ſold it for,*	5825*l.*	8*s.*	5*d.*	1*qr.*
	And gained	5777	8	5	1

5. A crafty Servant agreed with a Farmer (ignorant in Numbers) to ſerve him 12 Years, and to have nothing for his Service but the Produce of a Wheat Corn for the firſt Year; and that Product to be ſowed for the ſecond Year; and ſo on from Year to Year, until the End of the ſaid Time; I demand the Worth of the whole Produce, ſuppoſing the Increaſe to be but in a tenfold Proportion, and ſold out at 4*s. per* Buſhel? *Anſw.* 452112*l.* 4*s. rejecting Remainders.*

Note 1 7680 Wheat or Barley-Corns are ſuppoſed to make a Pint, and 64 Pint a Buſhel.

2. If the firſt Term in any Series, be either greater or leſs than the Ratio, (except Unity) then multiply any two Terms together, and their Product divide by the firſt Term; that Quotient will exactly correſpond with the Sum of their Indices.

6. A Threſher worked 20 Days at a Farmer's, and received for the firſt Day's Work, 4 Barley Corns; for the ſecond, 12 Barley-Corns; for the third, 36 Barley-Corns; and ſo on in triple Proportion Geometrical; I demand what the 20 Days Labour came to, ſuppoſing the whole Quantity to be ſold for 2*s.* 6*d. per* Buſhel? *Anſw.* 1773*l.* 7*s* 6*d. rejecting Remainders.*

7. A Merchant ſold 30 Yards of fine Velvet trimmed with Gold very curiouſly, at 2 Pins for the firſt Yard, 6 Pins for the ſecond, 18 Pins for the third, *&c.* in triple Proportion Geometrical; I demand how much the Velvet produced, when the Pins were afterwards ſold at 100 for a Farthing; alſo, whether the ſaid Merchant gained or loſt by the Sale thereof, and how much, ſuppoſing the ſaid Velvet to have been bought at 50*l. per* Yard?

Anſw.	*The Velvet produced*	2144699292*l.*	13*s.*	0*d.*½
	The Merchant gained	2144697792	13	0 ½

Of PERMUTATION.

Q. WHAT *is Permutation?*

A. Changing the Order of Things.

Q. *How do you find all the Variations, any Number of Things is capable of going through?*

A. Multiply all the given Terms one into another continually; the laſt Product is the Number of Changes required.

EXAM-

EXAMPLES.

1. I demand how many Changes may be rung upon twelve Bells; and alſo how long they would be in ringing but once over, ſuppoſing 24 Changes might be rung in one Minute, and the Year to contain 365 Days, 6 Hours? *Anſw The Number of Changes is* 479001600, *and the Time is* 37 *Years,* 49 *Weeks,* 2 *Days,* 18 *Hours.*

2. Seven Gentlemen, that were travelling, met together by chance, at a certain Inn upon the Road, where they were ſo well pleaſed with their Hoſt, and each other's Company, that in a Frolic, they offered him 30*l* to ſtay at that Place ſo long as they, together with him, could ſit every Day at Dinner in a different Order: The Hoſt thinking that they could not ſit in many different Poſitions, becauſe they were but a few of them, and that himſelf would make no conſiderable Alteration, he being but one, imagined that he ſhould make a good Bargain; and readily (for the ſake of a good Dinner and better Company) entered into an Agreement with them, and ſo made himſelf the eighth Perſon: I demand how long they ſtaid at the ſaid Inn, and how many different Poſitions they ſat in? *Anſw. The Number of Poſitions were* 40320; *and the Time that they ſtaid was* 110 *Years,* 142 *Days, allowing the Year to conſiſt of* 365 *Days,* 6 *Hours.*

Note, There is one Thing in Progreſſion, and in varying the Order of Things, which is well worth our Obſervation: and that is, The Power of Numbers, which is ſurprizingly great and beyond common belief; and is no ways conceivable by a common Practitioner, hardly by a very good Artiſt; it being (in appearance) not ſo much againſt Reaſon as above it. The firſt Example in Geometrical Progreſſion diſcovers what a prodigious Sum of Money a Horſe ſold after that Manner would produce, viz. no leſs than Four Millions four hundred ſeventy-three thouſand nine hundred and twenty-four Pounds: whereas, if the ſame Horſe had been ſold at the ſame Rate, and but a fourth Part of the Nails, he would have brought to his Owner no more than 5s. 3d ¾. The ſecond Example in Permutation, does likewiſe diſcover the Impoſſibility of the Innkeeper's performing his Promiſe; and in both, the Simplicity of two Men, who thinking they have got very good Bargains, do, inſtead thereof, find themſelves ſevere ſufferers. And although at the firſt Appearance, each Queſtion ſeems to produce but a mere Trifle; yet upon a mature Conſideration, there would not be found a Man in the Kingdom able to purchaſe the one, or long-liv'd enough to ſtand to the Agreement with the other. Hence obſerve the great Poſſibility of a Man's being impoſed on in this way, by Sharpers, without a careful examination into the affair, before any contraction is made.

THE

Schoolmaſters Aſſiſtant.

PART II.

Of VULGAR FRACTIONS.

Of Fractions in General

Q. W*HAT is a Fraction?*

A. It is a broken Number; and ſignifies the Part or Parts of a whole Number.

Q. *How many Kinds of Fractions are there?*

A. Two: Vulgar and Decimal.

Of NOTATION *of* VULGAR FRACTIONS.

Q. *What is a Vulgar Fraction?*

A. Any two Numbers placed thus $\frac{7}{8}$ make a Vulgar Fraction.

Q. *What is the upper Number of a Fraction called?*

A. It is called Numerator, and is the Remainder after Diviſion

Q. *What is the lower Number called?*

A. It is called Denominator; and notes any Whole divided into Parts: and is the Diviſor in Diviſion.

Q. *How many ſorts of Vulgar Fractions are there?*

A. Three: Proper, Improper, and Compound.

Q. *What is a proper Fraction?*

A. When the Numerator is leſs than the Denominator, as $\frac{7}{8}$.

Q. *How far may a proper Fraction be expreſſed?*

A. Without end; as $\frac{1}{2}$ may be called $\frac{2}{4}$ or $\frac{3}{6}$ or $\frac{4}{8}$, *&c.* but the loweſt Term $\frac{1}{2}$ is always deſired.

Q. *What is an improper Fraction?*

A. When the Numerator is greater than the Denominator, as $\frac{8}{7}$.

Q. *What is a compound Fraction?*

A. It is the Fraction of a Fraction; as $\frac{1}{2}$ of $\frac{2}{3}$, *&c.*

Of REDUCTION *of* VULGAR FRACTIONS.

CASE 1.

Q. H*OW are Vulgar Fractions reduced to a common Denominator?*

A. 1. Multiply each Numerator into all the Denominators but its own for a new Numerator.

2. Multiply all the Denominators for a common Denominator.

EXAM-

EXAMPLES.

1. Reduce $\frac{3}{6}$ and $\frac{5}{8}$ to a common Denominator. *Facit* $\frac{24}{48}$ and $\frac{30}{48}$.

2. Reduce $\frac{7}{8}$, $\frac{9}{10}$, and $\frac{11}{12}$ to a common Denominator. *Facit* $\frac{840}{960}$ $\frac{864}{960}$ and $\frac{880}{960}$.

3. Reduce $\frac{6}{10}$, $\frac{4}{8}$, $\frac{1}{9}$, and $\frac{6}{7}$ to a common Denominator. *Facit* $\frac{3024}{5040}$, $\frac{2520}{5040}$, $\frac{560}{5040}$, and $\frac{4320}{5040}$

4. Reduce $\frac{4}{9}$, $\frac{7}{11}$, $\frac{6}{7}$, and $\frac{1}{2}$ to a common Denominator. *Facit* $\frac{616}{1386}$, $\frac{882}{1386}$, $\frac{1188}{1386}$, and $\frac{693}{1386}$.

5. Reduce $\frac{6}{9}$, $\frac{2}{7}$, $\frac{1}{3}$, and $\frac{7}{8}$ to a common Denominator. *Facit* $\frac{1008}{1512}$, $\frac{432}{1512}$, $\frac{504}{1512}$, and $\frac{1323}{1512}$.

6 Reduce $\frac{4}{5}$, $\frac{1}{2}$, $\frac{5}{6}$, and $\frac{2}{8}$ to a common Denominator. *Facit* $\frac{384}{480}$, $\frac{240}{480}$, $\frac{400}{480}$ and $\frac{120}{480}$.

CASE 2.

Q. *How do you reduce a Vulgar Fraction to its loweſt Terms?*

A. 1. Find a common Meaſure by dividing the lower Term by the upper; and that Diviſor by the Remainder following, till nothing remains, the laſt Diviſor is the common Meaſure.

2. Divide both parts of the Fraction by the common Meaſure, and the Quotients will make the Fraction required.

Note 1. If the common Meaſure happens to be 1, the given Fraction is already in its loweſt Terms.

2. When a Fraction hath Cyphers at the right Hand, it may be abbreviated by cutting them off; thus $\frac{7|0}{9|0}$.

3. This Caſe will prove Caſe 1.

EXAMPLES.

1. Reduce $\frac{48}{56}$ to its loweſt Terms. Facit $\frac{6}{7}$.
2. Reduce $\frac{72}{94}$ to its loweſt Terms. Facit $\frac{36}{47}$.
3. Reduce $\frac{84}{170}$ to its loweſt Terms. Facit $\frac{42}{85}$.
4. Reduce $\frac{60}{125}$ to its loweſt Terms. Facit $\frac{12}{25}$.
5. Reduce $\frac{182}{196}$ to its loweſt Terms. Facit $\frac{13}{14}$.
6. Reduce $\frac{468}{1184}$ to its loweſt Terms. Facit $\frac{117}{296}$.

CASE 3.

Q *What is a mixt Number?*

A. It is compoſed of a whole Number and a Fraction, thus $7\frac{1}{2}$.

Q. *How is a mixt Number reduced to an improper Fraction?*

A. 1. Multiply the whole Number into the Denominator of the Fraction.

2. To the Product, add the Numerator for a new Numerator

3. Let its Denominator be the Denominator given.

Note, To expreſs a whole Number Fraction-wiſe, put 1 for its Denominator.

EXAMPLES.

1. Reduce $12\frac{15}{17}$ to an improper Fraction. Facit $\frac{219}{17}$.
2. Reduce $19\frac{12}{18}$ to an improper Fraction. Facit $\frac{354}{18}$.
3. Reduce $16\frac{18}{100}$ to an improper Fraction. Facit $\frac{1618}{100}$.
4. Reduce $12\frac{19}{56}$ to an improper Fraction. Facit $\frac{691}{56}$.
5. Reduce $100\frac{19}{59}$ to an improper Fraction. Facit $\frac{5919}{59}$.
6. Reduce $79\frac{12}{19}$ to an improper Fraction. Facit $\frac{1513}{19}$.

CASE 4.

Q. *How is an improper Fraction reduced to its proper Terms?*
A. Divide the upper Term by the lower.

Note, This Caſe and Caſe 3. prove each other.

EXAMPLES.

1. Reduce $\frac{219}{17}$ to its proper Terms. Facit $12\frac{15}{17}$.
2. Reduce $\frac{141}{17}$ to its proper Terms. Facit $8\frac{5}{17}$.
3. Reduce $\frac{126}{48}$ to its proper Terms. Facit $2\frac{30}{48}$.
4. Reduce $\frac{961}{17}$ to its proper Terms. Facit $56\frac{9}{17}$.
5. Reduce $\frac{13}{7}$ to its proper Terms. Facit $1\frac{6}{7}$.
6. Reduce $\frac{24}{7}$ to its proper Terms. Facit $3\frac{3}{7}$.

CASE 5.

Q. *How do you reduce a compound Fraction to a ſingle one?*
A. 1. Multiply all the Numerators for a new Numerator.
2. Multiply all the Denominators for a new Denominator.

EXAMPLES.

1. Reduce $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ to a ſingle Fraction. Facit $\frac{6}{24}$.
2. Reduce $\frac{7}{8}$ of $\frac{4}{6}$ of $\frac{9}{10}$ to a ſingle Fraction. Facit $\frac{252}{480}$.
3. Reduce $\frac{12}{14}$ of $\frac{5}{6}$ of $\frac{1}{2}$ to a ſingle Fraction. Facit $\frac{60}{168}$.
4. Reduce $\frac{5}{9}$ of $\frac{4}{8}$ of $\frac{3}{4}$ to a ſingle Fraction. Facit $\frac{60}{288}$.
5. Reduce $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{4}{5}$ to a ſingle Fraction. Facit $\frac{54}{60}$.
6. Reduce $\frac{1}{2}$ of $\frac{8}{9}$ of $\frac{6}{7}$ to a ſingle Fraction. Facit $\frac{48}{126}$.

CASE 6.

Q. *How do you reduce the Fraction of one Denominator to the Fraction of another, but greater, retaining the ſame Value?*

A. 1. Reduce the given Fraction to a compound Fraction, by comparing it with all the Denominations between it, and that Denomination, which you would reduce it to.

2. Reduce that compound Fraction to a ſingle One, by Caſe 5.

EXAMPLES.

1. Reduce $\frac{5}{6}$ of a Penny to the Fraction of a Pound. *Facit* $\frac{5}{1440}$ *l.*

2. Reduce $\frac{1}{2}$ of a Farthing to the Fraction of a Shilling. *Facit* $\frac{1}{96}$ *s.*

3. Reduce $\frac{8}{9}$ of an Ounce Troy, to the Fraction of a Pound. *Facit* $\frac{8}{108}$ *lb.*

4. Reduce $\frac{6}{7}$ of a Pound Avoirdupois to the Fraction of a *C. wt.* *Facit* $\frac{6}{184}$ *C. wt.*

5. Reduce $\frac{9}{13}$ of a Pint of Wine to the Fraction of a *hhd.* *Facit* $\frac{9}{6552}$ *hhd.*

CASE 7.

Q. *How do you reduce the Fraction of one Denomination to the Fraction of another, but leſs, retaining the ſame Value?*

A. Multiply the given Numerator, by the Parts of the Denominations between it, and that Denomination you would reduce the Fraction to, for a new Numerator, and place it over the given Denominator.

Note, This Caſe. and Caſe 6, prove each other.

EXAMPLES.

1. Reduce $\frac{5}{1440}$ of a Pound to the Fraction of a penny. *Facit* $\frac{1209}{1440}=\frac{5}{6}$ *d.*

2. Reduce $\frac{1}{96}$ of a Shil. to the Fraction of a Farth. *Facit* $\frac{1}{2}$ *q*

3. Reduce $\frac{8}{108}$ of a *lb.* Troy to the Fraction of an *Oz.* *Facit* $\frac{8}{9}$ *oz*

4. Reduce $\frac{6}{784}$ of a *C. wt.* to the Fraction of a *lb.* *Facit* $\frac{6}{7}$ *lb*

5. Reduce $\frac{9}{6552}$ of a *hhd.* of Wine to the Fraction of a pint. *Facit* $\frac{9}{13}$ *Pint.*

CASE 8.

Q. *How do you reduce Vulgar Fractions from one Denomination to another of the ſame Value, having the Numerator of the required Fraction given?*

A. As the Numerator of the given Fraction,
Is to its Denominator:
So is the Numerator of the intended Fraction,
To its Denominator.

EXAMPLES.

1. Reduce $\frac{3}{4}$ to a Fraction of the ſame Value, whoſe Numerator ſhall be 15. *Facit* $\frac{15}{20}=\frac{3}{4}$.

2. Reduce $\frac{7}{8}$ to a Fraction of the ſame Value, whoſe Numerator ſhall be 42. *Facit* $\frac{42}{48}$.

3. Reduce $\frac{3}{4}$ to a Fraction of the ſame Value, whoſe Numerator ſhall be 34. *Facit* $\frac{34}{45}$ $\frac{1}{3}$.

4. Reduce $\frac{5}{9}$ to a Fraction of the ſame Value, whoſe Numerator ſhall ſhall be 73. *Facit* $\frac{73}{131}$ $\frac{2}{5}$.

Note, From Caſes 8 and 9, there ariſes a new Fraction, which may not improperly be called a mixed Fraction.

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CASE 9.

Q. *How do you reduce Vulgar Fractions from one Denomination to another of the ſame Value, having the Denominator of the required Fraction given?*

A. As the Denominator of the given Fraction,
Is to its Numerator:
So is the Denominator of the intended Fraction,
To its Numerator.

Note, This Caſe and Caſe 8, prove each other.

EXAMPLES.

1. Reduce $\frac{3}{4}$ to a Fraction of the ſame Value, whoſe Denominator ſhall be 20. *Facit* $\frac{15}{20}=\frac{3}{4}$.

2. Reduce $\frac{7}{8}$ to a Fraction of the ſame Value, whoſe Denominator ſhall be 49. *Facit* $\frac{42}{49}\,\frac{7}{8}$.

3. Reduce $\frac{3}{4}$ to a Fraction of the ſame Value, whoſe Denominator ſhall be 46. *Facit* $\frac{43}{46}\,\frac{3}{4}$.

4. Reduce $\frac{5}{9}$ to a Fraction of the ſame Value, whoſe Denominator ſhall be 131 $\frac{2}{5}$. *Facit* $\frac{73}{131}\,\frac{2}{5}$.

CASE 10.

Q. *How is a mixed Fraction reduced to a ſingle one?*

A. 1. When the Numerator is the integral Part: Then

(1.) Multiply it by the Denominator of the fractional Part, and to that Product add the Numerator of the fractional Part, for a new Numerator.

(2.) Multiply the Denominator of the Fraction by the Denominator of the fractional Part of the Numerator, for a Denominator.

Note, This proves Caſe 9.

EXAMPLES.

1. Reduce $\frac{42}{49}\,\frac{7}{8}$ to a ſimple Fraction. *Facit* $\frac{7}{8}$.
2. Reduce $\frac{34}{46}\,\frac{1}{2}$ to a ſimple Fraction. *Facit* $\frac{3}{4}$.
3. Reduce $\frac{17}{43}\,\frac{4}{9}$ to a ſimple Fraction. *Facit* $\frac{157}{387}$.

2. When the Denominator is the integral Part: Then

(1.) Multiply it by the Denominator of the fractional Part, and to that Product add the Numerator of the fractional Part, for a new Denominator.

(2.) Multiply the Numerator of the Fraction by the Denominator of the fractional Part, for a new Numerator.

Note, This proves Caſe 8.

EXAMPLES.

1. Reduce $\frac{73}{131}\,\frac{2}{5}$ to a ſimple Fraction. *Facit* $\frac{365}{657}=\frac{5}{8}$.
2. Reduce $\frac{41}{73}\,\frac{1}{4}$ to a ſimple Fraction. *Facit* $\frac{104}{393}$.
3. Reduce $\frac{7}{19}\,\frac{3}{5}$ to a ſimple Fraction. *Facit* $\frac{15}{98}=\frac{5}{14}$.

CASE II.

Q. *How do you find the proper Quantity of a Fraction in the known Parts of an Integer?*

A. Multiply the Numerator by the common Parts of the Integer, and divide by the Denominator.

EXAMPLES.

1. Reduce $\frac{2}{3}$ of a Pound Sterling to its proper Quantity. *Facit* 13 *s.* 4 *d.*

2. Reduce $\frac{18}{43}$ of a Shil. to its proper Quantity. *Facit* 5*d.* $\frac{1}{43}$.

3. Reduce $\frac{6}{7}$ of 5*l.* 9*s.* to its proper Quantity. *Facit* 4*l.* 13*s* 5*d.* $\frac{1}{7}$

4. Reduce $\frac{12}{16}$ of a *lb.* Troy to its proper Quantity. *Facit* 9*oz.*

5. Reduce $\frac{12}{78}$ of a Ton Weight to its proper Quantity. *Facit* 3 *C.* 0 *qr.* 8 *lb.* 9 *oz.* 13 *dr.* $\frac{42}{78}$.

6. Reduce $\frac{5}{9}$ of a *lb.* Avoirdupois to its proper Quantity. *Facit* 8 *oz.* 14 *dr.* $\frac{2}{9}$.

7. Reduce $\frac{9}{11}$ of 10 *C.* 1 *qr.* 12 *lb.* to its proper Quantity. *Facit* 8 *C.* 1 *qr.* 25 *lb.* 1 *oz.* 7 *dr.* $\frac{3}{11}$.

8. Reduce $\frac{4}{7}$ of a Mile to its proper Quantity. *Facit* 4 *fur.* 125 *yds.* 2 *feet.* 1 *in.* 2 *bc.* $\frac{1}{7}$.

9. Reduce $\frac{9}{10}$ of a Yard to its proper Quantity. *Facit* 2 *feet,* 8 *in.* 1 *bc.* $\frac{2}{10}$.

10. Reduce $\frac{4}{5}$ of an Ell Engliſh to its proper Quantity. *Facit* 1 *Yard.*

11. Reduce $\frac{7}{16}$ of an Acre to its proper Quantity. *Facit* 1 *Rood,* 30 *Perches.*

12. Reduce $\frac{4}{9}$ of a Tun of Wine to its proper Quantity. *Facit* 1 *hhd.* 49 *galls.*

13. Reduce $\frac{7}{8}$ of a Barrel of Beer to its proper Quantity. *Facit* 30 *galls.* $\frac{1}{2}$.

14. Reduce $\frac{3}{8}$ of a Chaldron of Coals to it proper Quantity. *Facit* 13 *buſh.* $\frac{1}{2}$.

15. Reduce $\frac{2}{7}$ of a Quarter of Corn to its proper Quantity. *Facit* 2 *buſh.* 1 *peck* $\frac{1}{7}$.

16. Reduce $\frac{7}{13}$ of a Day natural to its proper Quantity. *Facit* 12 *hrs.* 55 *min.* 23 *ſec.* $\frac{1}{13}$.

17. Reduce $\frac{4}{5}$ of a Month to its proper Quantity. *Facit* 3 *weeks,* 1 *day,* 9 *hrs.* 36 *min.*

18. What is the proper Quantity of $\frac{7}{8}$ of a Yard of Cloth? *Anſw.* 3 *qrs.* 2 *na.*

19. What is the proper Quantity of $\frac{2}{9}$ of a *hhd.* of Beer? *Anſw.* 12 *galls.*

20. What is the proper Quantity of $\frac{3}{16}$ of a Barrel of Ale? *Anſw.* 6 *galls.*

CASE 12.

Q. *How do you reduce any given quantity to the Fraction of any greater Denomination of the ſame kind?*

A. 1. Reduce the given Quantity to the loweſt term mentioned for a Numerator.

2. Reduce the integral part to the ſame term for a Denominator, and that will be the Fraction required.

Note 1. If there be a Fraction given with the ſaid Quantity, let it be put to the Numerator of the Fraction required.

2. Caſes 11 and 12 prove each other.

EXAMPLES.

1. Reduce 13 *s.* 4 *d.* to the Fraction of a Pound Sterling. *Facit* $\frac{160}{248}=\frac{2}{3}$ *l.*

2. Reduce 5 *d.* $\frac{1}{43}$ to the Fraction of a ſhilling. *Facit* $\frac{18}{43}$ *s.*

3. What part of 5 *l.* 9 *s.* is 4 *l.* 13 *s.* 5 *d.* $\frac{1}{7}$? *Anſw.* $\frac{6}{7}$.

4. Reduce 9 *oz.* Troy to the Fraction of a *lb.* *Facit* $\frac{6}{12}=\frac{3}{4}$ *lb.*

5. Reduce 3 *C.* 0 *qr.* 8 *lb.* 9 *oz.* 13 *dr.* $\frac{42}{78}$ to the Fraction of a Ton. *Facit* $\frac{12}{78}$ *Ton.*

6. Reduce 8 *oz.* 14 *dr.* $\frac{2}{9}$ to the Fraction of a *lb.* Avoirdupois. *Facit* $\frac{5}{9}$ *lb.*

7. What part of 10 *C.* 1 *qr.* 12 *lb.* is 8 *C.* 1 *qr.* 25 *lb.* 1 *oz.* 7 *dr.* $\frac{2}{11}$? *Anſw.* $\frac{9}{11}$.

8. Reduce 4 *fur.* 125 *yds.* 2 *feet,* 1 *in.* 2 *b.c.* $\frac{1}{7}$ to the Fraction of a Mile. *Facit* $\frac{4}{7}$ *Mile.*

9. Reduce 2 *feet,* 8 *in.* 1 *b.c.* $\frac{2}{10}$ to the Fraction of a Yard. *Facit* $\frac{9}{10}$ *Yard.*

10. Reduce 1 yard to the Fraction of an Ell. *Facit* $\frac{4}{5}$ *Ell.*

11. Reduce 1 rood, 30 poles, to the Fraction of an Acre. *Facit* $\frac{7}{16}$ *acre.*

12. Reduce 1 *hhd.* 49 *galls.* of Wine to the Fraction of a Tun. *Facit* $\frac{4}{9}$ *Tun.*

13. Reduce 31 *galls.* $\frac{1}{2}$ of Beer to the Fraction of a Barrel. *Facit* $\frac{7}{8}$ *Barrel.*

14. Reduce 13 *buſh.* $\frac{1}{2}$ of Coals to the Fraction of a Chaldron. *Facit* $\frac{3}{8}$ *Chaldron.*

15. Reduce 2 *buſh.* 1 *peck* $\frac{1}{7}$ of Corn to the Fraction of a Quarter. *Facit* $\frac{2}{7}$ *Quarter.*

16. Reduce 12 *hrs.* 55 *min.* 23 *ſec.* $\frac{1}{13}$ to the Fraction of a Day natural. *Facit* $\frac{7}{13}$ *Day.*

17. Reduce 3 *w.* 1. *d.* 9 *hrs.* 36 *min.* to the Fraction of a Month. *Facit* $\frac{4}{5}$ *Month.*

18. Reduce 3 *qrs.* 2 *na.* to the Fraction of a Yard. *Facit* $\frac{7}{8}$ *Yard.*

19. Reduce 12 *gals*. of beer to the fract. of a *hhd*. *Facit* $\frac{14}{18}$ *hhd*

20. Reduce 6 *gals*. of Ale to the fract. of a Bar. *Facit* $\frac{3}{16}$ *bar*.

21. Reduce 13 *hrs*. 30 *min*. to the Fraction of a Day. *Facit* $\frac{810}{1440}=\frac{9}{16}$.

Of ADDITION *of* VULGAR FRACTIONS.

Q. HOW *are Vulgar Fractions added together?*

A. 1. Reduce the given Fractions to a common Denominator.

2. Add all the Numerators together for a new Numerator; under which ſubſcribe the common Denominator.

Note, This Rule is proved by Subtraction, when two Fractions only are given.

EXAMPLES.

1. Add $\frac{1}{2}$ and $\frac{7}{8}$ together. - - Facit $1\frac{6}{16}$.
2. Add $\frac{7}{10}$ and $\frac{11}{12}$ and $\frac{4}{9}$ together. - Facit $2\frac{66}{1080}$.
3. Add 19 and $7\frac{1}{2}$ of $\frac{2}{3}$ together. - Facit $26\frac{2}{6}$.
4. Add $\frac{1}{2}$ of $\frac{7}{8}$ and $\frac{2}{3}$ of $\frac{19}{20}$ together. - Facit $1\frac{68}{960}$.
5. Add $\frac{1}{3}$ of 95 and $\frac{7}{8}$ of 14 together. - Facit $43\frac{22}{24}$.
6. Add $\frac{2}{3}$ and $17\frac{1}{2}$ together. - - Facit $18\frac{1}{6}$.
7. Add $12\frac{1}{2}$ and $3\frac{2}{3}$ and $4\frac{3}{4}$ together - Facit $20\frac{22}{24}$.
8. Add $6\frac{7}{8}$ of $\frac{9}{10}$ and $\frac{4}{7}$ of $\frac{1}{2}$ and $7\frac{1}{2}$ together. Facit $14\frac{1284}{2240}$.

Note, In order to find the following Facits, the Fractions given muſt be reduced to their proper Quantities by Caſe 11, in Reduction, and then added, as in Addition of whole Numbers.

9. Add $\frac{7}{8}$ of a pound to $\frac{3}{4}$ of a ſhilling. Facit 18 *s*. 3 *d*.
10. Add $\frac{3}{4}$ of a penny to $\frac{2}{9}$ of a pound. Facit 2 *s*. 3 *d*. 1 *qr* $\frac{6}{9}$.
11. Add $\frac{1}{2}$ of a *lb*. Troy to $\frac{7}{12}$ of an *oz*. Facit 6 *oz*. 11 *dwts*. 16 *gr*.
12. Add $\frac{4}{7}$ of a Ton to $\frac{9}{10}$ of an *C. wt*. Facit 12 *C*. 1 *qr*. 8 *lb*. 12 *oz*. 12 *dr*. $\frac{8}{10}$.
13. Add $\frac{3}{4}$ of a Mile to $\frac{7}{10}$ of a furlong. Facit 6 *fur*. 28 *poles*.
14. Add $\frac{1}{2}$ of a Yard to $\frac{2}{3}$ of a foot. Facit 2 *feet*, 2 *inch*.
15. Add $\frac{1}{3}$ of a Day to $\frac{1}{2}$ of an Hour. Facit 8 *hrs*. 30 *min*.
16. Add $\frac{4}{9}$ of a chaldron to $\frac{7}{8}$ of a buſh. Facit 16 *buſh*. 3 *pecks* $\frac{1}{2}$.
17. Add $\frac{1}{3}$ of a Week, to $\frac{1}{4}$ of a Day, and $\frac{1}{2}$ of an Hour together. Facit 2 *days*, 14 *hrs*. $\frac{1}{2}$.
18. Add $\frac{2}{3}$ of a Yard, $\frac{3}{4}$ of a foot, and $\frac{7}{8}$ of a Mile together. Facit 1540 *yds*. 2 *feet*, 9 *in*.

Of SUBTRACTION *of* VULGAR FRACTIONS.

Q. HOW *are Vulgar fractions ſubtracted?*

A. 1. Reduce the given Fractions to a common Denominator.

2. Subtract the leſſer Numerator from the greater, and place that difference over the common Denominator.

3. When the lower Fraction is greater than the upper, ſubtract the Numerator of the lower Fraction from the Denominator, and to that difference add the upper Numerator, carrying one to the Unit's Place of the lower whole Number.

Note, This Rule is proved by Addition.

EXAMPLES.

1. From $\frac{111}{112}$ to $\frac{3}{4}$ — — Facit $\frac{108}{448}$.
2. From $\frac{97}{100}$ take $\frac{3}{7}$ — — Facit $\frac{379}{700}$.
3. From $96\frac{1}{3}$ take $14\frac{3}{7}$ — Facit $81\frac{19}{21}$.
4. From 96 take $\frac{3}{5}$ — — Facit $95\frac{2}{5}$.
5. From $\frac{1}{3}$ of 76 take $\frac{3}{4}$ of 21 — Facit $9\frac{7}{12}$.
6. From $\frac{100}{110}$ take $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ — Facit $\frac{1956}{2640}$.
7. From $71\frac{1}{2}$ take $\frac{17}{19}$ — — Facit $70\frac{23}{38}$.
8. From $14\frac{1}{4}$ take $\frac{2}{3}$ of 19. — Facit $1\frac{7}{12}$.

Note, In order to find the following Facits, the Fractions given muſt be reduced to their proper Quantities by Caſe 11, in Reduction, and then ſubtracted, as in Subtraction of whole Numbers.

9. From $\frac{1}{2}$ of a pound take $\frac{3}{4}$ of a ſhilling. Facit 9 *s.* 3 *d.*
10. From $\frac{1}{2}$ of a ſhilling take $\frac{3}{4}$ of a penny. Facit 5 *d.* $\frac{1}{4}$.
11. From $\frac{3}{5}$ of an *oz.* take $\frac{7}{8}$ of a *dwt.* Facit 11 *dwts.* 3 *gr.*
12. From $\frac{1}{2}$ of an *C. wt.* take $\frac{7}{12}$ of a pound, Facit 1 *qr.* 27 *lb.* 6 *oz.* 10 *dr.* $\frac{8}{12}$
13. From $\frac{2}{5}$ of a League take $\frac{7}{10}$ of a Mile. Facit 1 *mile,* 2 *fur.* 16 *poles.*
14. From 1 Ell take $\frac{7}{10}$ of a *qr.* Facit 1 *yd.* 0 *qr.* 1 *na.* $\frac{2}{10}$.
15. From $\frac{3}{12}$ of a *hhd.* of Beer take 1 Gallon. Facit 12 *gals.* $\frac{1}{2}$
16. From $\frac{4}{8}$ of a Chaldron take $\frac{2}{3}$ of a Buſhel. Facit 17 *buſh.* 1 *peck* $\frac{1}{3}$.
17. From 7 Weeks take 9 Days $\frac{7}{10}$. Facit 5 *wks.* 4 *days,* 7 *hrs.* 12 *min.*
18. From 4 *days,* 7 *hrs.* $\frac{1}{4}$, take 1 *day* 9 *hrs.* $\frac{3}{18}$. Facit 2 *d.* 22 *hrs.* $\frac{1}{3}$.

Of MULTIPLICATION *of* VULGAR FRACTIONS.

Q. HOW *are Vulgar Fractions multiplied?*

A. 1. Prepare the given Numbers (if need be) by the Rules of Reduction.

2. Multiply all the given Numerators for a new Numerator, and all the Denominators for a new Denominator.

Note, When any Number, either whole or mixt, is multiply'd by a Fraction, the Product is always leſs than the Multiplicand, in the ſame Proportion as the multiplying Fraction is leſs than 1 or an Unit.

EXAMPLES.

1. Multiply $\frac{3}{7}$ by $\frac{3}{11}$ - Facit $\frac{9}{77}$.
2. Multiply $\frac{4}{8}$ by $\frac{7}{9}$ - Facit $\frac{28}{72}$.
3. Multiply $\frac{1}{3}$ of $\frac{4}{5}$ by $\frac{7}{10}$ of $\frac{11}{12}$ Facit $\frac{308}{1830}$.
4. Multiply $7\frac{1}{4}$ by $8\frac{1}{2}$ - Facit $61\frac{5}{8}$.
5. Multiply $4\frac{1}{2}$ by $\frac{1}{8}$ - Facit $\frac{9}{16}$.
6. Multiply $\frac{7}{8}$ by $13\frac{9}{10}$ Facit $12\frac{13}{80}$.
7. Multiply $\frac{1}{2}$ of 7 by $\frac{3}{6}$ - Facit $1\frac{9}{12}$.
8. Multiply $\frac{3}{8}$ of 8 by $\frac{7}{8}$ of 5 Facit 21.
9. Multiply $\frac{3}{6}$ by $\frac{4}{9}$ of 11 Facit $2\frac{24}{54}$.
10. Multiply $\frac{4}{5}$ of 91 by $71\frac{1}{2}$ - Facit $5205\frac{2}{10}$.
11. Multiply $12\frac{3}{5}$ by $\frac{2}{6}$ of 7 Facit $29\frac{12}{30}$.
12. Multiply $7\frac{1}{2}$ by $9\frac{1}{4}$ - Facit $69\frac{3}{8}$.

Of DIVISION *of* VULGAR FRACTIONS.

Q. HOW *are vulgar fractions divided?*

A. 1. Prepare the Numbers given (if need be) by the Rules of Reduction.

2. Multiply the Denominator of the Diviſor into the Numerator of the Dividend, for a new Numerator; and the Numerator of the Diviſor into the Denominator of the Dividend, for a new Denominator.

Note 1. When the Dividend is greater than the Diviſor, the Quotient will be greater than the Dividend: But when the Dividend is leſs than the Diviſor, then the Quotient will be leſs than the Dividend, and in the ſame Proportion as an Unit is greater or leſs than the dividing Fraction.

2. Multiplication and Diviſion prove each other.

EXAMPLES.

1. Divide $\frac{17}{21}$ by $\frac{3}{5}$ - - Facit $1\frac{22}{63}$.
2. Divide $\frac{13}{19}$ by $\frac{7}{9}$ - - Facit $\frac{117}{138}$.
3. Divide $\frac{14}{18}$ by $\frac{7}{10}$ - - Facit $1\frac{14}{126}$.
4. Divide $1\frac{1}{2}$ by $4\frac{8}{10}$ - Facit $\frac{30}{96}$.
5. Divide $\frac{7}{8}$ by 4 - - Facit $\frac{7}{32}$.
6. Divide 4 by $\frac{7}{8}$ - - Facit $4\frac{7}{8}$.
7. Divide 99 by 108 - Facit $\frac{99}{108}$.
8. Divide $\frac{1}{5}$ of 19 by $\frac{2}{3}$ of $\frac{3}{4}$ - Facit $7\frac{18}{30}$.
9. Divide $\frac{1}{2}$ of $\frac{2}{3}$ by $\frac{2}{3}$ of $\frac{3}{4}$ - Facit $\frac{24}{36}$.
10. Divide $\frac{2}{3}$ of $\frac{3}{4}$ by $\frac{1}{2}$ of $\frac{2}{3}$ - Facit $\frac{12}{24}$.
11. Divide $4\frac{5}{9}$ by $\frac{5}{9}$ of 4 - Facit $2\frac{1}{20}$.
12. Divide $\frac{5}{9}$ of 4 by $4\frac{5}{9}$ - - Facit $\frac{20}{41}$.

Of

Of the SINGLE RULE *of* THREE DIRECT *in* VULGAR FRACTIONS.

Q. HOW *is the Rule of Three in Fractions performed?*

A. The Operation of the Rule of Three in Fractions, both Single and Double, Vulgar and Decimal, are exactly agreeable to the Principles laid down in the ſame Rules in whole Numbers.

Q. *How are the following Examples proved?*

A. By changing the order of them.

EXAMPLES.

1. If $\frac{11}{15}$ *lb.* of Sugar coſt $\frac{7}{15}$ of a Shilling, what coſt $\frac{32}{45}$ *lb*? *Anſw.* $\frac{2912}{7095}$ *s* = 4 *d.* 3 *qrs.* $\frac{4071}{7095}$.

2. If $\frac{3}{5}$ Ell coſt $\frac{2}{3}$ *l.* what coſt $\frac{12}{17}$ Ell? *Anſw.* 15 *s.* 8 *d.* $\frac{36}{153}$.

3. If $\frac{4}{7}$ Ell coſt $\frac{7}{13}$ *l.* what coſt 1 Ell? *Anſw.* 18 *s.* 10 *d.* $\frac{8}{52}$

4. If 2 *oz* of Silver coſt 16 *s.* 5 *d.* what coſt $\frac{3}{4}$ *oz.*? *Anſw.* 6 *s.* 1 *d.* 3 *qrs.* $\frac{1}{2}$.

5. If 6 Yards $\frac{1}{2}$ coſt 18 *s.* what coſt 9 Yards $\frac{1}{4}$? *Anſw.* 1 *l.* 5 *s.* 7 *d.* 1 *qr.* $\frac{28}{52}$.

6. If 1 Dollar be worth 56 *d.* $\frac{3}{5}$, what are 500 Dollars worth? *Anſw.* 117 *l* 18 *s.* 4 *d.*

7. If 1 *yd* $\frac{1}{4}$ coſt 9 *s.* what coſt 16 *yds* $\frac{1}{4}$? *Anſw.* 5 *l.* 17 *s.*

8. If 1 Piſtole be 17 *s.* $\frac{1}{5}$, what are 100 Piſtoles? *Anſ.* 86 *l.*

9. If $\frac{5}{7}$ *oz.* coſt $\frac{11}{12}$ *l.* what coſt 1 *oz*? *Anſw.* 1 *l.* 5 *s.* 8 *d.*

10. If an Ingot of Silver weighs 16 *oz* $\frac{11}{15}$, what is it worth at 5 *s.* 6 *d* *per oz*? *Anſw* 4 *l.* 12 *s.* 0 *d* 1 *qr.* $\frac{9}{15}$.

11. If $\frac{9}{10}$ *C.* coſt 14 *l* 4 *s.* what will 7 *C.* $\frac{1}{2}$ coſt? *Anſw.* 118 *l.* 6 *s.* 8 *d.*

12. If $\frac{3}{5}$ of an Ell coſt $\frac{2}{3}$ of 19 *s.* what coſt 7 Ells? *Anſw.* 7 *l.* 7 *s* 9 *d.* 1 *qr.* $\frac{3}{9}$

13 If 8 *lb* of Tobacco coſt 4 *s.* 9 *d.* $\frac{3}{5}$, what coſt 1 *lb.*? *Anſw.* 7 *d* $\frac{1}{5}$.

14. If 1 *yd* of broad Cloth coſt 15 *s* $\frac{5}{8}$, what will 4 Pieces, each containing 27 *yds.* $\frac{3}{8}$, coſt? *Anſw.* 85 *l.* 10 *s.* 11 *d.* $\frac{1}{4}$.

15. A Mercer bought 3 Pieces $\frac{1}{2}$ of Silk, each containing 24 *yds.* $\frac{1}{3}$, at 6 *s.* 0 *d* $\frac{1}{2}$ *per* Yard; I demand the Value of the 3 Pieces $\frac{1}{2}$ at that Rate? *Anſw.* 25 *l* 14 *s.* 6 *d.* 2 *qrs* $\frac{4}{11}$.

16. If $\frac{1}{3}$ *lb.* leſs by $\frac{1}{8}$ coſt 13 *d* $\frac{1}{5}$, what coſt 14 *lb* leſs by $\frac{1}{3}$ of 2 *lb.* *Anſw.* 4 *l.* 9 *s.* 9 *d* $\frac{2}{25}$.

17. A Merchant had 5 *C* $\frac{8}{9}$ of Sugar, at 6 *d.* $\frac{3}{4}$ *per lb.* which he would barter for Tea, at 8 *s* $\frac{5}{8}$ *per lb.* I demand how much Tea muſt be given for the Sugar? *Anſw.* 43 *lb* $\frac{6}{414}$.

18. Bought 120 *lb.* of Tea, at 8 *s* $\frac{5}{8}$ *per lb.* and ſold it for 70 *l.* what was the Gain *per Cent.*? *Anſw.* 35 *l.* 5 *s.* 3 *d.* 3 *qrs.* $\frac{75}{3310}$.

Of the SINGLE RULE *of* THREE INVERSE *in* VULGAR FRACTIONS.

1. IF $3\frac{1}{4}$ Yards of Cloth that is $1\frac{1}{5}$ Yard wide, be ſufficient to make a Cloke; how much muſt I have of that ſort which is $\frac{4}{5}$ of a Yard wide to make a Cloke of the ſame bigneſs? *Anſw.* $4\frac{7}{8}$ Yards.

2. If 16 Men finiſh a Piece of Work in $28\frac{1}{3}$ Days, how long will 12 Men require to do the ſame Work? *Anſw.* $37\frac{28}{30}$ Days.

3. If $1\frac{1}{4}$ Yards in Breadth require $20\frac{1}{2}$ Yards long to make a Garment; what Length will $\frac{3}{4}$ of a Yard wide require to make the ſame? *Anſw.* $34\frac{4}{24}$

4. How many Pieces of Merchandize, at 20 *s.* $\frac{1}{8}$ *per* Piece, are to be given for 240 Pieces $\frac{1}{7}$, at 12*s.* $\frac{1}{2}$ *per* Piece? *Anſw.* $149\frac{354}{2254}$ Pieces.

5. How many Yards of Canvas that is 1 Yard $\frac{1}{4}$ wide, will be ſufficient to line 20 Yards of Say, that is $\frac{3}{4}$ of a Yard wide? *Anſw.* 12 *Yards of Canvas.*

Of the DOUBLE RULE *of* THREE *in* VULGAR FRACTIONS.

1. IF 9 Students ſpend 10*l.* $\frac{7}{9}$ in 18 Days, how much will 20 Students ſpend in 30 Days? *Anſw.* 39 *l.* 18 *s.* 4 *d.* $\frac{360}{2458}$.

2. Three Men having worked 19 Days $\frac{1}{2}$, received 8 *l.* $\frac{9}{10}$, how much muſt 20 Men have for 100 Days $\frac{1}{4}$? *Anſw.* 305 *l.* 0 *s* 8 *d.* +

3. A Man and his Wife having laboured 1 Day, earned 4 *s.* $\frac{5}{8}$; I demand how much they muſt have for 10 Days $\frac{1}{2}$, when their two Sons helped them? *Anſw.* 4 *l.* 17 *s.* 1 *d.* $\frac{1}{2}$.

4. A Man with his Family, which in all were five Perſons, did uſually drink 7 Gallons $\frac{4}{5}$ of Beer in a Week; how much will be drunk in 22 Weeks $\frac{1}{2}$, when three Perſons more come into the Family? *Anſw.* 280 $\frac{40}{50}$ *Galls.*

5. Seven Men with their Wives, upon examining into their Expences for 20 Weeks paſt, found that they had laid out 40 *l.* $\frac{4}{5}$; I demand in what time 20 *l.* $\frac{3}{7}$ may be ſpent by 46 Men in the like Proportion? *Anſw.* 3 *Weeks* $\frac{3136}{65688}$.

6. Three Sailors having been abroad 9 Months $\frac{1}{4}$, received 40 *l.* $\frac{3}{15}$; I demand how much 100 Sailors muſt receive for 28 Month $\frac{3}{7}$ Service? *Anſw.* 4118 *l.* 6 *s.* 0 *d.* $\frac{1}{4}$. +

THE

Schoolmaſters Aſſiſtant.

PART III.

Of DECIMAL FRACTIONS.

Q. *WHAT do you underſtand by Decimals in general?*

A. Any Thing which is called One; as one Foot, one Pound, one Shilling, one Year, *&c.* is conceived in Imagination to be divided into ten equal Parts, and every one of thoſe Parts into ten other equal Parts, and ſo on, by a Decimal Diviſion, without End.

Q. *What is a Decimal Fraction?*

A. Any Number having a Point placed before it, thus, ,641 is a Decimal.

Q. *How do you diſtinguiſh a whole Number from a Decimal Fraction?*

A. Any Number having a Point placed after it, thus, 641. is a whole Number.

Q. *What is a mixt Number?*

A. Any quantity of Figures having a Point placed ſomewhere between them, thus, 6,41, or thus, 64.1, is a mixt Number.

Note, The Decimal Point muſt never be omitted; becauſe without it a Decimal cannot be diſtinguiſhed from a whole or mixt Number. But when a whole Number alone is given, it is as common to omit it as to inſert it; as appears by ſeveral Examples following.

Of NOTATION *of* DECIMALS.

Q. *How do Decimal Places increaſe?*

A. In the ſame Manner as whole Numbers do: that is, by Tens: For every Place towards the left Hand is ten times greater than that which is next it towards the right Hand, as appears by the following Table.

TABLE.

6	*C. Thouſands*
5	*X. Thouſands*
4	*Thouſands*
3	*Hundreds*
2	*Tens*
1.	*Units*
2	*Tenth Parts*
3	*Hundredth Parts*
4	*Thouſandth Parts*
5	*X. Thouſandth Parts*
6	*C. Thouſandth Parts*

Q. *May not Cyphers ſometimes be annexed to Decimals?*

A. They may; but they alter not their Value: Thus .41 and .4100 are the ſame.

Q. *May not Cyphers ſometimes be prefixed to Decimal Parts?*

A. Yes; and then they decreaſe their Value, by removing them further from the Point: Thus .0041 is leſs than .41

Of ADDITION *and* SUBTRACTION *of* DECIMALS.

Q. HOW *are Decimals added or ſubtracted?*

A. Place the Numbers according to their Value, and work as in Addition or Subtraction of whole Numbers.

Q. *How are the Operations proved?*

A. As in whole Numbers.

EXAMPLES *in* ADDITION.

Shillings.	*Yards.*	*Acres.*	*£.*
14.471	47.4	7004.16	71.001
1.191	19.71	712.712	120.07
1.8126	461.721	19.0174	31.121
3.6126	400.004	7.3126	13.4101
7.1281	7.1004	71.1851	76.04
18.8126	7.07	3.108	7.3

Miles.	*lb.*	*Acres.*	*Ounces.*
41.8102	86.18104	.61271	48.9108
140.037	3.14	.8712	1.8191
18.10	1.181	.012	3.1080
7.8141	7.7121	.87	.7012
16.4612	8.19817	.04	.0012
7.81	13.071	.4	.0018

EXAMPLES *in* SUBTRACTION.

	Years.	*Days*	*Weeks.*	*Hours.*
From	1081.761	712.10009	127.19	12.
Take	10.00012	7.121	121.	.12
Rem.				

	Minutes.	*Months.*	*Ells.*	*Tuns.*
From	174.1	6100.	.172618	761.8109
Take	1.471	6.109	.000148	18.9112
Rem.				

Of MULTIPLICATION *of* DECIMALS.

Q. HOW *are Decimals multiplied?*
A. As whole Numbers are.

Note 1. When Numbers are multiplied, make as many Decimal Parts in the Product, as there are in the two Factors together.

2. If Decimal Places are wanting in the Product, ſupply them with Cyphers to the Decimal Point.

3. Obſerve the ſame Note here, which is given in Multiplication of Vulgar Fractions.

Q. *How are the following Examples proved?*
A. By inverting the Factors.

EXAMPLES.

1. Multiply .612 by 4.12
2. Multiply 48. by .48
3. Multiply 37.9 by 46.5
4. Multiply .121 by 17.2
5. Multiply 1.81 by 71.
6. Multiply 4.1 by 1.42
7. Multiply .00071 by .121
8. Multiply .00041 by .00017
9. Multiply .0027 by 41.
10. Multiply 410. by .0012
11. Multiply .07 by .07
12. Multiply 1.007 by .41
13. Multiply 4.00 by .004
14. Multiply .004 by .004

Of DIVISION *of* DECIMALS.

Q. *HOW are Decimals divided?*

A. As whole Numbers are.

Note 1. The Decimal Places of the Diviſor and Quotient muſt always be equal to thoſe in the Dividend.

2. If there be more Decimals in the Diviſor than in the Dividend, annex as many Cyphers as you pleaſe to the Dividend, ſo as to be equal at leaſt to the Diviſor.

3. If Decimal places are wanting in the Quotient, they muſt be ſupplied with Cyphers to the Decimal point.

4 Obſerve the ſame Note here, which is given in Divſion of Vulgar Fractions.

Q. *How are the following Examples proved?*

A. By Multiplication.

EXAMPLES.

1. Divide 19.4 by 37.5
2. Divide 47121.1 by 4.7
3. Divide 4.18 by .1812
4. Divide .76121 by 41.
5. Divide .612821 by 7.21
6. Divide .121819 by .721
7. Divide 9. by .7121
8. Divide 9. by .9
9. Divide 14. by 47.31
10. Divide 1. by 863.
11. Divide .012181 by .12
12. Divide .0001212 by .018

Of REDUCTION *of* DECIMALS.

CASE 1.

Q. *HOW do you reduce a Vulgar Fraction to a Decimal?*

A. Divide the upper Term by the lower.

Note 1. Both Terms are to be eſteemed whole Numbers.

2. By this Caſe, Tables containing the Decimal Parts of an Integer are conſtructed.

EXAMPLES.

1. Reduce $\frac{5}{26}$ to a Decimal. *Facit* .1923076+
2. Reduce $\frac{5}{28}$ to a Decimal. *Facit* .1785714+

3. Reduce

3. Rednce $\frac{11}{14}$ of $\frac{10}{13}$ to a Decimal. *Facit* .6043956+

4. Reduce 7 *s.* 6 *d.* to the Decimal of a Pound. *Facit* .375 *l.*

5. Reduce 10 *s*, 9 *d.*¼ to the Decimal of a Pound. *Facit* .5385316+*l.*

6. Reduce 24 Grains to the Decimal of a *lb.* Troy. *Facit* .0041666+*lb.*

7. Reduce 14 drams to the decimal of a *lb.* Avoirdupois. *Facit* .0546875 *lb.*

8. Reduce 4 *C.* 2 *qrs.* to the decimal of a Ton. *Facit* 225 *Ton.*

9. Reduce 14 *C.* to the decimal of a Ton. *Facit* .7 *Ton.*

10. Reduce 174 drams to the decimal of an *C.* *Facit* .0060686+*C.*

11. Reduce 4 Inches to the decimal of a Yard. *Facit* .111111+*Yard.*

12. Reduce 76 Yards to the decimal of a Mile. *Facit* .04318181+*Mile.*

13. Reduce 1 Mile to the decimal of a League. *Facit* .33333333 *League.*

14. Reduce 3 *qrs.* 2 *na.* to the decimal of a yard. *Facit* .875 *yd.*

15. Reduce 4 Perches to the decimal of an Acre. *Facit* .025 *Aere.*

16. Reduce 1 Pint to the decimal of a Gallon. *Facit* .125 *gal.*

17. Reduce 1 Gallon of Wine to the decimal of a *hhd.* *Facit* .015873+*hhd.*

18. Reduce 7 Minutes to the decimal of a day. *Facit* .0048611+*day.*

19. Reduce 2 days to the decimal of a Week. *Facit* .2857142+*Week.*

20. Reduce 72 days to the decimal of a year. *Facit* .1972602+*year.*

CASE 2.

Q. *How do you find the proper Quantity of a Decimal Fraction in the known Parts of an Integer?*

A. Multiply it by the common Parts of the Integer.

Q. *How do you prove Queſtions in this Caſe?*

A. By Caſe 1.

EXAMPLES.

1. What is the proper quantity of .76 of a Pound? *Anſw.* 15 *s.* 2 *d.* 1.6 *qr.*

2. What is the proper quantity of .861 of a *C. wt.*? *Anſw.* 3 *qrs.* 12 *lb.* 6 *oz.* 14.592 *dr.*

3. What is the proper quantity of .461 of a Shilling? *Anſw.* 5 *d.* 2.128 *qrs.*

4. What is the proper quantity of .761 of a *hhd.* of Wine? *Anſw.* 47 *gals.* 3 *qts.* 1.544 *pt.*

5. What is the proper quantity of .17 of a Ton of Wine? *Anſw.* 42 *gals.* 3.36 *qts.*

6. What is the proper quantity of .761 of a Day? *Anſw.* 18 *hrs.* 15 *min.* 50.4 *ſec.*

7. What is the proper quantity of .7 of a *lb.* of Silver? *Anſw.* 8 *oz.* 8 *dwts.*

8. What is the proper quantity of .71 of 4 *oz.* of Gold? *Anſw.* 2 *oz.* 16 *dwts.* 19.2 *gr.*

9. What is the proper quantity of .67 of a League? *Anſw.* 2 *miles,* 0 *fur.* 3 *poles,* 1 *yd.* 0 *feet,* 3 *in.* 1.8 *b c.*

10. What is the proper quantity of .712 of a Furlong? *Anſw.* 28 *poles,* 2 *yds.* 1 *foot,* 11.04 *in.*

11. What is the proper quantity of .07 of a Barrel of Ale? *Anſw.* 2 *gals.* 1.92 *pt.*

12. What is the proper quantity of .4712 of an Ell Engliſh? *Anſw.* 2 *qrs.* 1.424 *na.*

13. What is the proper quantity of .72 of a *hhd.* of Beer? *Anſw.* 38 *gals.* 3.52 *qts.*

14. What is the proper quantity of .61 of a Ton of Wine? *Anſw.* 2 *hhds.* 27 *galls.* 2 *qts.* 1.76 *pt.*

15. What is the proper quantity of .092 of 3 Acres, 2 Roods? *Anſw.* 1 *Rood,* 11.52 *Poles.*

16. What is the proper quantity of .461 of a Chaldron of Coals? *Anſw.* 16 *buſh.* 2.384 *pecks.*

17. What is the proper quantity of .712 of 3 *qrs.* of Corn? *Anſw.* 17 *buſh.* 2.816 *qts.*

18. What is the proper quantity of .3 of a Year? *Anſw.* 109 *days.* 12 *hrs.*

19. What is the proper quantity of .5 of an hour? *Anſ.* 30 *m.*

20. A certain Tenant hired an Houſe for 9 Years at 12.4 *l. per annum;* how much was due at the end of the Term? *Anſw.* 111 *l.* 12 *s.*

Note, 1. To this Caſe is referred Caſe 4. in Practice, p. 55.

EXAMPLE.

1286 at 4s.

1ſt. 4s is = .2 l.

2d. 1286

.2

257.2

20

4.0

Facit 279 l. 4s.

2. Addition and Subtraction of Decimals of different Denominations, may eaſily be perform'd after the Decimals are reduced to their proper Quantities.

EX-

EXAMPLES.

1. What is the Sum of .48 *l.* and .16 *s.* reduced to their proper quantities? *Anſw* 9 *s.* 9.12 *d.*

2. What is the Sum of .17 *lb.* Troy, and .84 *oz*? *Anſw.* 2 *oz.* 17 *dwts.* 14.4 *gr.*

3. What is the Sum of .17 Ton .19 *C.* .17 *qr.* and .7 *lb*? *Anſw.* 3 *C.* 2 *qrs.* 15.54 *lb.*

4. What is the difference between .17 *l.* and .7 *s*? *Anſw.* 2 *s* 8 *d.* 1.6 *qr.*

5. What is the difference between .41 Day and .16 Hour? *Anſw.* 9 *hours*, 40 *min.* 48 *ſec.*

Of the SINGLE RULE *of* THREE DIRECT *in* DECIMALS.

Q. HOW *do you prove the following Queſtions?*
A. By changing their Order.

EXAMPLES.

1. If 1.4 *lb.* of Mace coſt 14.5 *s.* what coſt 75.31 *lb*? *Anſw.* 38 *l.* 19 *s.* 11 *d.* 3.52 *qrs.*

2. If 1.6 *C.* of Sugar coſt 3 *l.* 12.76 *s.* what coſt 3 *hhds.* each 11 *C.* 3 *qrs.* 10.12 *lb*? *Anſw.* 80 *l.* 15 *s.* 3 *d.* 3.36 *qrs.*

3. If 1.5 *oz.* of Silver be worth 7.8 *s.* what is the Value of 9.7 *lb*? *Anſw.* 30 *l.* 5 *s.* 3 *d.* 1.44 *qr.*

4. If 1.47 *C* of Sugar be worth 4.5 *l.* what is 1.7 *lb.* worth at that Rate? *Anſw.* 11.1 *d*

5. If 1 Pint of Wine coſt 1.2 *s.* what coſt 12.5 *hhds*? *Anſw* 378 *l.*

6. If 8.4 *lb.* of Tobacco coſt 16 *s.* 4.6 *d.* what coſt 3 *hhds*, each 4 *C.* 2 *qrs.* 7.4 *lb*? *Anſw.* 149 *l.* 12 *s.* 3 *d.* 2 *qrs.*

7. If 1 Yard of Cloth coſt 12.3 *s.* what coſt 3 Pieces, each 21.5 Yards? *Anſw.* 39 *l.* 13 *s.* 4.2 *d.*

8. A Man bought a Piece of Cloth for 6 *l.* 13.12 *s.* I demand how many Yards there were in the ſame, when he gave after the Rate of 4 *s.* 2.6 *d. per* Yard? *Anſw.* 31.569 *Yards.*

9. A Man bought 5.8 Tuns of Oil for 60.4 *l.* but by Misfortune it chanced to leak out 50.9 Gallons; I demand how he muſt ſell the reſt *per* Gallon to be no loſer? *Anſw.* 10.27 *d. per Gallon.*

10. Two Men bartered, *A* had 40.7 *yds.* of Linen, for which *B* gave him 25.6 Ells of Holland, at 4.5 *s per* Ell; I demand the price of the Linen *per* Yard? *Anſw.* 2 *s.* 9 *d.* 3.8 *qrs.*

11. A Grocer bought 7.6 *C.* of Sugar, at 40.1 *s. per C.* and ſold the ſame out at 4.5 *d. per lb.*; I demand whether he gained or loſt, and how much? *Anſw.* 14 *s.* 5 *d.* 1.12 *qr. gain.*

12. A Brewer made a Quantity of Beer, which coſt him 90.4 *l.* and afterwards ſold it for 26.7 *s. per* Barrel, by which he gained 10 *l.* I demand the Quantity that was brewed? *Anſw.* 75 *Bar.* 7.4+*Gals.*

13. A Grocer bought 3 *C.* 1.5 *qr.* of Cloves, at the Rate of 2.75 *s. per lb.* and ſold them for 60 *l.* 11 *s.* 6 *d.* what did he gain or loſe by the Bargain? *Anſw. He gained* 8 *l.* 12 *s.*

14. A Merchant bought 436 Yards of Cloth for 8.5 *s. per* Yard, and ſold it again for 10.75 *s. per* Yard; what did he gain by the ſale thereof? *Anſw.* 49 *l.* 1 *s. gain.*

15. *A* owes *B* 296.85 *l.* but he compounds for 7.5 *s.* in the Pound; what muſt *B* receive for his debt? *Anſw.* 111 *l.* 6 *s.* 4 *d.* 2 *qrs.*

16. Bought 3 *hhds.* of Tobacco, each weighing 4 *C.* 1.9 *qr.* at 5.6 *l. per C.* which I ſold out at 7 *l.* 16 *s. per C.* what did I gain by the whole? *Anſw.* 29 *l.* 10 *s.* 8 *d.* 1.6 *qr.*

17. A Jeweller bought a Diamond for 60 Guineas, and after it was neatly cut, weighed 1.5 *oz.* which he ſold again for 3.25 *s. per* Grain; I demand how much he gained by the ſaid Diamond; and alſo at what Rate *per Cent.* he made his Gain?

Anſw. { *Whole gain* —54 *l.* 0 *s.* 0 *d.* 0 *qr.*
{ *Gain per cent.* 85 14 3 1.7+

Of

Of the SQUARE-ROOT.

Q. *WHAT is a Square?*

A. Any Number multiplied by itſelf produces a Square.

Q. *What is the Extraction of the Square-Root?*

A. If a Square be given to find one Side, it is called the Extraction of the Square-Root.

Q. *How is the given Square to be prepared for Extraction?*

A. By pointing off at every two Figures, from the Unit's Place, both ways for a Reſolvend.

Q. *What is a Surd?*

A. It is an imperfect Square, or ſuch a Number, whoſe Square-Root can never be exactly found.

EXAMPLES.

1. What is the Square of 17.1? *Anſw.* 292.41
2. What is the Square of .09? *Anſw.* .0081
3. What is the Square of .0094? *Anſw.* .00008836
4. What is the Square-root of 4712.81261? *Anſw.* 68.649+
5. What is the Square-root of 9712.718051? *Anſw.* 98.553+
6. What is the Square-root of 3.1721812? *Anſw.* 1.78106+
7. What is the Square-root of 1.3976121? — — *Anſw.* 1.1822+
8. What is the Square-root of 761.801216? — — *Anſw.* 27.6007+
9. What is the Square-root of .0007612816? — — *Anſw.* .02759+
10. What is the Square-root of 4.000067121? — — *Anſw.* 2.000016+

11. There is an Army conſiſting of a certain Number of Men, who are placed Rank and File, that is, in the Form of a Square, each ſide having 472 Men; I demand how many Men the whole Square contains? *Anſw.* 222784 *Men.*

12. The Floor of a certain great Room is made exactly Square, each ſide of which contains 75 Feet; I demand how many ſquare Feet are contained therein? *Anſw.* 5625 *Feet.*

13. Suppoſe 12544 Soldiers are to be put into Rank and File, in the form of an equal Square; I demand how many ſoldiers will be in the front, and how many deep? *Anſw.* 112.

14. A certain ſquare Pavement contains 197136 ſquare Stones, all of the ſame ſize; I demand how many are contained in one of its ſides? *Anſw.* 444.

15. The Wall of a Town is 17 Feet high, which is ſurrounded by a Mote of 20 Feet in breadth; I demand the length of a Ladder which ſhall reach from the outſide of the Mote to the top of the Wall? *Anſw.* 20.2 + *Feet*

Of the SQUARE-ROOT *of a* VULGAR FRACTION.

Q. *How is the Square-Root of a Vulgar Fraction extracted?*

A. 1. Reduce the Fraction to its loweſt Term.

2. Extract the Square-root of the Numerator for a new Numerator, and the Square-root of the Denominator for a new Denominator.

3. If the Fraction be a Surd, reduce it to a Decimal, and then extract the Square-root from it.

4. The Decimal Fraction muſt conſiſt of an even Number of Places, as two, four, *&c.*

EXAMPLES.

1. What is the Square-root of $\frac{3044}{6849}$? *Anſw.* $\frac{2}{3}$.
2. What is the Square-root of $\frac{3456}{5400}$? *Anſw.* $\frac{4}{5}$.
3. What is the Square-root of $\frac{7056}{9216}$? *Anſw.* $\frac{7}{8}$.

SURDS.

4. What is the Square-root of $\frac{3168}{6192}$? *Anſw.* .71528 +
5. What is the Square-root of $\frac{208}{272}$? *Anſw.* .87447 +
6. What is the Square-root of $\frac{387}{738}$? *Anſw.* .72414 +

Of the SQUARE-ROOT *of a* MIXT NUMBER.

Q. *How is the Square-root of a mixt Number extracted?*

A. 1. Reduce the fractional Part of a mixt Number to its loweſt Term.

2. Reduce the mixt Number to an improper Fraction.

3. Extract the Roots of the Numerator and Denominator, for a new Numerator and Denominator.

4. If the mixt Number given, be a Surd, reduce the fractional Part to a Decimal, and annex it to the whole Number, and extract the Square-root from the whole.

EXAMPLES.

1. What is the Square-root of $39\frac{36}{39}$? *Anſw.* $6\frac{1}{7}$.
2. What is the Square-root of $17\frac{16}{25}$? *Anſw.* $4\frac{1}{5}$.
3. What is the Square-root of $5\frac{288}{648}$? *Anſw.* $2\frac{1}{3}$.

SURDS.

4. What is the Square-root of $76\frac{14}{17}$? *Anſw.* 8.7649 +
5. What is the Square-root of $7\frac{9}{11}$? *Anſw.* 2.7961 +

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Extracting the ROOT

A TABLE O

Roots, - - or Firſt Powers	1	2	3	4	
Squares, - - or Second Powers	1	4	9	16	
Cubes, - - or Third Powers	1	8	27	64	
Biquadrates, - or Fourth Powers	1	16	81	256	
Surſolids, - - or Fifth Powers	1	32	243	1024	
Square Cubes, - or Sixth Powers	1	64	729	4096	
Second Surſolids, - or Seventh Powers	1	128	2187	16384	
Biquadrates ſquared, - or Eighth Powers	1	256	6561	65536	
Cubes cubed, - - or Ninth Powers	1	512	19683	262144	1
Surſolids ſquared, - or Tenth Powers	1	1024	59049	1048576	9
Third Surſolids, - or Eleventh Powers	1	2048	177147	4194304	48
Square cubes ſquared, - or 12th Powers	1	4096	531441	16777216	244
Fourth Surſolids, - or 13th Powers	1	8192	1594323	67108864	1220
Second Surſolids ſquared, or 14th Powers	1	16384	4782969	268435456	6103
Surſolids cubed, - - or 15th Powers	1	32768	14348907	1073741824	30517

Let this fold agai

GING SERIES;

OR,

OTS of all POWERS.

E of POWERS.

4	5	6	7	8	9
16	25	36	49	64	81
64	125	216	343	512	729
56	625	1296	2401	4096	6561
24	3125	7776	16807	32768	59049
96	15625	46656	117649	262144	531441
84	78125	279936	823543	2097152	4782969
36	390625	1679616	5764801	16777216	43046721
44	1953125	10077696	40353607	134217728	387420489
76	9765625	60466176	282475249	1073741824	3486784401
04	48828125	362797056	1977326743	8589934592	31381059609
16	244140625	2176782336	13841287201	68719476736	282429536481
64	1220703125	13060694016	96889010407	549755813888	2541865828329
56	6103515625	78364164096	678223072849	4398046511104	22876792454961
24	30517578125	470184984576	4747561509943	35184372088832	205891132094649

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SERIES;

OWERS.

ERS.

Root	6	7	8	9
Squa	6	49	64	81
Cub	6	343	512	729
Biqu	6	2401	4096	6561
Surf	6	16807	32768	59049
Squ	6	117649	262144	531441
Secc	6	823543	2097152	4782969
Biq	6	5764801	16777216	43046721
Cub	6	40353607	134217728	387420489
Sur	6	282475249	1073741824	3486784401
Thi	6	1977326743	8589934592	31381059609
Squ	6	13841287201	68719476736	282429536481
Fo	6	96889010407	549755813888	2541865828329
Sec	6	678223072849	4398046511104	22876792454961
Su	6	4747561509943	35184372088832	205891132094649

Of the CUBE-ROOT.

Q. *WHAT is a Cube?*

A. Any Number multiplied by its Square produces a Cube.

Q. *What is the Extraction of the Cube-Root?*

A. If a Cube be given to find out the Number, which being multiplied into its Square, produceth the Number given; this is called the Extraction of the Cube-Root.

Q. *How is the given Cube to be prepared for Extraction?*

A. By pointing off at every three Figures, both Ways, from the Units Place, for a Reſolvend,

Q. *What is a Surd?*

A. It is an imperfect Cube, or ſuch a Number, whoſe Cube-Root can never be exactly found.

Q. *What is the Rule for extracting the Cube-Root of a Number?*

A. This: The firſt Figure ſought is the Root of the greateſt Cube contained in the firſt Member, and it is called a; then $3aa+3a$ is the Diviſor, which finds a new Figure called e; then $3aae+3eea+eee$ is the Subtrahend or Number to be ſubducted; which Operation is to be continued to every Reſolvend.

Note, This Rule being ſomewhat dark, I ſhall by way of Illuſtration, ſubjoin the Operation, at large, for extracting the Cube-Root of any Number.

What is the Cube-Root of 444194·947?

(1.) Let the given Number be pointed as before directed;

$$\text{thus } \dot{4}44\dot{1}94\cdot94\dot{7}$$

(2.) The firſt Member, which contains the greateſt Cube is 444; and the neareſt Root, whoſe Cube is not greater than it, is 7, which ſet

$$\text{thus } \dot{4}44\dot{1}94\cdot94\dot{7}(7$$

(3.) The Cube of 7 is 343, which ſet down and ſubtract, annexing the next three Figures or Members, viz. 194 for a Reſolvend;

$$\begin{array}{l} \text{thus } \dot{4}44\dot{1}94\cdot94\dot{7}(7 \\ 343 \\ \hline 101194 \text{ Reſolvend.} \end{array}$$

(4.) The Number 7, in the Root, is called *a*; then by the Rule, $3aa+3a$ is the Diviſor; thus,

$7=a$
$7=a$
$49=aa$
3
$147=3aa$
$21=3a$
Diviſor $1491=3aa+3a$

$444194.947(7$
343
$1491)101194$ Reſolvend.

(5.) The next Figure in the Root, *viz.* 6 (found by common Diviſion) is called *e*; then by the Rule $3aae+3eea-eee$, is the Subtrahend, or Number to be ſubducted; thus,

$147=3aa$
$6=e$
$882=3aae$
$756=3eea$
$216=eee$
Sub. $95976=3aae+3eea+eee$

eee viz. $6=216$

$6=e$
$6=e$
$36=ee$
3
$108=3ee$
$7=a$
$756=3eea$

$444194.947(76$
343
$1491)101194$ Reſolvend
95976 Subtrahend
$5218\ .947$ Reſolvend

(6.) When the next Member is brought down, *viz.* 947, as before, both Figures in the Root, *viz.* 76, muſt be called *a*; then to find a Diviſor to this laſt Reſolvend, ſay as before, $3aa+3a$; thus,

$76=a$
$76=a$
456
532
$5776=aa$
3
$17328=3aa$
$228=3a$
Diviſor $173508=3aa+3a$

$76=a$
3
$228=3a$

$444194.947(76$
343
$1491)101194$ Reſolvend
95976 Subtrahend
$173508)5218\ 947$ Reſolvend

(7.) The next Figure in the Root, *viz.* 3, found as before, is alſo called e; then again $3aae + 3eea + eee$ is the other Subtrahend, or Number to be ſubducted; thus,

$17328 = 3aa$
$3 = e$
———
$51984 = 3aae$
$2052 = 3eea$
$27 = eee$
———
Sub. $5218947 = 3aae + 3eea + eee$

eee viz. $3 = 27$

$3 = e$
$3 = e$
—
$9 = ee$
3
—
$27 = 3ee$
$76 = a$
——
162
189
——
$2052 = 3eea$

444194 947(76.3 Anſwer
343
1491)101194 Reſolvend
95976 Subtrahend
———
173508)5218 .947 Reſolvend
5218 .947 Subtrahend
———
0

EXAMPLES.

1. What is the Cube of 6.4?	*Anſw.* 262.144
2. What is the Cube of .13?	*Anſw.* .002197
3. What is the Cube of 41.1?	*Anſw.* 69426.531
4. What is the Cube of .09?	*Anſw.* .000729
5. What is the Cube of .007?	*Anſw.* 000000343
6. What is the Cube-Root of 7612.812161? —	*Anſw.* 19.67 +
7. What is the Cube-Root of 7612181.7612? —	*Anſw.* 196.71 +
8. What is the Cube-Root of 61218.00121? —	*Anſw.* 39.41 +
9. What is the Cube-Root of 7121.1021698? —	*Anſw.* 19.238 +
10. What is the Cube-Root of 12000.812161? —	*Anſw.* 22.89 +
11. What is the Cube-Root of .121861281? —	*Anſw.* .495 +
12. What is the Cube-Root of .0069761218? —	*Anſw.* .19107 +

13. If a Cubical Piece of Timber be 41 Inches long, 41 Inches broad, and 41 Inches deep, how many Cubical Inches doth it contain? *Anſw.* 68921 *Cubical Inches.*

14. Suppoſe a Cellar to be dug that ſhall be 12 Feet every way, in length, breadth, and depth; how many ſolid Feet of Earth muſt be taken out to complete the ſame? *Anſw.* 1728.

15. Suppoſe a Stone of a cubic Form to contain 474552 ſolid Inches; what is the ſuperficial Content of one of its Sides? *Anſw.* 6084 *Inches.*

Of the CUBE-ROOT *of a* VULGAR FRACTION.

Q. *How do you extract the Cube-Root of a Vulgar Fraction?*

A. 1. Reduce the Fraction to its loweſt Term?

2. Extract the Cube-Roots of the Numerator and Denominator for a new Numerator and Denominator.

3. If the Fraction be a Surd, reduce it to a Decimal, and then extract the Cube-root from it.

4. The Decimal Fraction muſt conſiſt of Ternaries of Places, as *three, ſix, nine,* &c.

EXAMPLES.

1. What is the Cube-root of $\frac{352}{1188}$? *Anſw.* $\frac{2}{3}$.
2. What is the Cube-root of $\frac{1944}{4608}$? *Anſw.* $\frac{3}{4}$.
3. What is the Cube-root of $\frac{648}{3000}$? *Anſw.* $\frac{3}{5}$.

SURDS.

4. What is the Cube-root of $\frac{4}{9}$? *Anſw* .763 +
5. What is the Cube-root of $\frac{6}{7}$? *Anſw.* .949 +
6. What is the Cube-root of $\frac{1}{3}$? *Anſw.* .693 +

Of the CUBE-ROOT *of a* MIXT NUMBER.

Q. *How do you extract the Cube-Root of a Mixt Number?*

A. 1. Reduce the fractional Part to its loweſt Terms.

2. Reduce the mixt Number to an improper Fraction.

3. Extract the Cube-roots of the Numerator and Denominator, for a new Numerator and Denominator.

4. If the mixt Numerator given be a Surd, reduce the fractional Part to a Decimal, and annex it to the whole Number, and extract the Cube-Root from the Whole.

EXAMPLES.

1. What is the Cube-Root of $578\frac{19}{27}$? *Anſw.* $8\frac{1}{3}$.
2. What is the Cube-Root of $42\frac{21}{24}$? *Anſw.* $3\frac{1}{2}$.
3. What is the Cube-Root of $5\frac{104}{125}$? *Anſw.* $1\frac{4}{5}$.

SURDS.

4. What is the Cube-Root of $8\frac{2}{12}$? *Anſw.* 2.013 +
5. What is the Cube-Root of $7\frac{1}{5}$? *Anſw.* 1.966 +

Of the BIQUADRATE-ROOT.

Q. WHAT *is a Biquadrate Number?*

A. Any Number involved four Times produces a Biquadrate.

Q. *How is the Biquadrate-Root extracted?*

A. Firſt extract the Square-root of the given Reſolvend: and then extract the Square-root of that Square-root, for the Biquadrate-root required

EXAMPLES.

1. What is the Biqnadrate of 48? *Anſw.* 5308416.
2. What is the Biquadrate of 96? *Anſw.* 84934656.
3. What is the Biquadrate-root of 5308416? *Anſw.* 48.
4. What is the Biquadrate-root of 84934656? *Anſw.* 96.
5. What is the Biquadrate-root of 21743271936? — — } *Anſw.* 384.

Of the SURSOLID-ROOT.

Q. WHAT *is a Surſolid?*

A. Any Number involved five Times, produces a Surſolid.

Q. *How is the Surſolid-Root, or the Root of any other higher Power extracted?*

A. By the following general Rules.

1. If any even Power be given, let the Square-root of it be extracted, which reduces it to half of the given Power, then the Square root of that Power reduces it to half of the ſame Power; and ſo on till you come to a Square or a Cube.

For Example: Suppoſe a 24th Power be given; the Square-root of that reduces it to a 12th Power; the Square-root of the 12th Power reduces it to a 6th Power; and the Square-root of the 6th Power to a Cube.

2. If any odd Power be given, as the 17th *&c.* obſerve,

(1.) From the Unity Place both ways, point off at every ſuch Number of Figures as is the Index of the Power for a Reſolvend.

(2.) Seek in the Table of Powers, for ſuch a Power (being the ſame Power with the Index) as comes neareſt the firſt Period, whether greater or leſs, calling its Root accordingly more than juſt, or leſs than juſt.

(3.) Annex ſo many Cyphers to the Root, as there are Periods of whole Numbers in the given Reſolvend.

(4.) Find the Difference between the given Reſolvend, and the Power coming neareſt the firſt Period.

(5.) Whatever odd Power is given, the next loweſt odd Power to that of the ſaid Root muſt be found, with its annexed Cyphers: *i. e.* if the 9th Power be given, find the 7th Power of the Root and Cyphers; if the 11th Power be given, find the 9th, *&c.*

(6.) Multiply that next loweſt odd Power by the Index of the given Power, and let that Product be a Diviſor to the Difference between the given Reſolvend and Power firſt found, which depreſſes it to a Square.

(7.) Point this Square into Periods of two Figures each.

(8.) Then make the firſt Root without its Cyphers a Diviſor, and aſk how oft it may be found in the firſt Period of the Square.

(9.) If the Diviſor be leſs than juſt, you muſt multiply the Quotient Figure by half the Index, *i. e.* if the Index be 11, multiply the Quotient Figure by 5; if the Index be 9, multiply it by 4, *&c.* and add it to the Diviſor; but if it be more than juſt, you muſt ſubtract it from the Diviſor, having a Cypher annexed, or ſuppoſed to be annexed to the Diviſor; which Sum ~~or Difference~~ muſt be multiplied by the ſaid Quotient Figure, and ſo continued to every new Figure in the Quotient.

(10.) If the firſt Root with its Cyphers be more than juſt, the Quotient muſt be ſubtracted from it; but if it be leſs than juſt, it muſt be added to it; and the Sum or Difference will be the Root required.

3. If an even Power be given, and the Square-Root of the Power being extracted, reduces it to an odd Power, you muſt then proceed with that odd Power as the foregoing Rule directs.

EXAMPLES.

1. What is the Surſolid of 6436343.?

6436343
32 *the neareſt Surſolid, whoſe Root and Cypher is* 20.
3236343
The Cube of 20 *is* =8000
And 8000 + 5 *is*=40000
Then 40000)3236343(80 *Laſtly* 20
Again 2)80(3 + 3
+ 3 + 2=6 78
1*ſt Diviſor*=26— 23 *the Surſolid*
2 *to be rejected.* *Root required.*

Note, This is a very expeditious Way of extracting the Roots of high Powers, but it is not always exact, becauſe (as Mr. Ward obſerves, for it was taken from him) there will be a Remainder, and ſometimes an Exceſs or Defect in the laſt figure of the Root, when the given Reſolvend or Power hath a true Root; as appears by the fifth Example following, whoſe true Root ſhould not be 384.3 as it there ſtands, but 384.

2. What is the Surſolid of 48? *Anſw.* 254803968.
3. What is the Surſolid-root of 8153726976? *Anſw.* 96.
4. What is the Surſolid-root of 254803968? *Anſw.* 48.
5. What is the Surſolid-root of 8349416423424.? — — *Anſw.* 384.3.

Of the SQUARE-CUBE-ROOT.

Q. WHAT *is a Square-Cube?*

A. Any Number involved ſix Times, produces a Square-Cube

EXAMPLES.

1. What is the Square-Cube of 48.? — — — *Anſw.* 12230590464
2. What is the Square-Cube-root of 782757789696.? — *Anſw.* 96.
3. What is the Square-Cube-root of 12230590464.? — *Anſw.* 48.
4. What is the Square-Cube-root of 3206175906594816.? — *Anſw.* 384.

Of the SECOND SURSOLID-ROOT.

Q. WHAT *is the Second Surſolid?*

A. Any Number involved ſeven Times produces a Second Surſolid.

EXAMPLES.

1. What is the ſecond Surſolid of 96.? — *Anſw.* 75144747810816.
2. What is the ſecond Surſolid-root of 75144747810816.? — — *Anſw.* 96.
3. What is the ſecond Surſolid-root of 587068342272.? — — *Anſw.* 48.
4. What is the ſecond Surſolid-root of 1231171548132409344.? — *Anſw.* 384.42.

Of the SQUARE-BIQUADRATE-ROOT.

Q. WHAT *is a Square-biquadrate?*

A. Any Number involved eight Times, is a Biquadrate Squared, or Square-Biquadrate.

EXAMPLES.

1. What is the Squared-biquadrate of 48.? — *Anſw.* 28179280429056.

2. What is the Square-Biquadrate-root of 7213895789838336.? — *Anſw.* 96.

3. What is the Square-Biquadrate-root of 28179280429056.? — — *Anſw.* 48.

4. What is the Square Biquadrate root of 4727698744828845188096.? — *Anſw.* 384

Of the CUBED CUBE-ROOT.

Q. WHAT *is a Cubed Cube?*

A. Any Number involved nine Times, is a Cubed Cube.

EXAMPLES.

1. What is the Cubed Cube-root of 6925339958244480256.? — *Anſw.* 96.2

2. What is the Cubed Cube-root of 13526054605946 88.? — *Anſw.* 48.09.

3. What is the Cubed Cube-root of 1815443631801412552228864.? *Anſw.* 384.5

Of the SQUARE-SURSOLID-ROOT.

Q. WHAT *is a Squared Surſolid?*

A. Any Number involved ten Times, produces a Square Surſolid.

EXAMPLES.

1. What is the Squared-Surſolid-root of 64925062108545024.? — *Anſw.* 48.

2. What is the Squared-Surſolid-root of 66483263599150104576.? — *Anſw.* 96.

3. What is the Squared-Surſolid-root of 69712754611742420055883776.? *Anſw.* 384.3

Of the THIRD SURSOLID-ROOT.

Q. WHAT *is a Third Surſolid?*

A. Any Number involved eleven Times produces a Third Surſolid.

EXAMPLES.

1. What is the third Surſolid-root of 952809757913927.? — — *Anſw.* 23.

2. What is the third Surſolid-root of 3116402981210161152.? — *Anſw.* 48.

3. What is the third Surſolid-root of 6382393305518410039296.? — *Anſw.* 96.

Of the SQUARED SQUARE-CUBE-ROOT

Q. WHAT *is a Squared Square Cube?*

A. Any Number involved twelve times produces a Squared Square Cube.

EXAMPLES.

1. What is the Root of this Squared Square Cube 1495873098087735296. ?	*Anſw.* 48.
2. What is the Root of this Squared Square Cube 6127097573297673637724l6. ?	*Anſw.* 96.
3. What is the Root of this Squared Square Cube 102795639440290902917603980738 56?	*Anſw.* 384

A GENERAL RULE *for extracting the* ROOTS *of all* Powers.

1. PRepare the given Number for Extraction, by pointing off from the unity Place, as the root required directs.

2. Find the firſt Figure in the root by your own Judgment, or by Inſpection into the Table of Powers.

3. Subtract it from the given Number.

4. Augment the remainder by the next Figure in the given Number, that is, by the firſt Figure in the next Point, and call this your Dividend.

5. Involve the whole root, laſt found, into the next inferior Power to that which is given.

6. Multiply it by the Index of the given Power, and call this your Diviſor.

7. Find a Quotient Figure by common Diviſion, and annex it to the root.

8. Involve all the root, thus found, into the given Power.

9. Subtract this Power (always) from as many Points of the given Power as you have brought down, beginning at the loweſt Place.

10. To the remainder bring down the firſt Figure of the next Point for a new Dividend.

11. Find a new Diviſor as before, and in like manner proceed till the Work is ended.

EX-

EXAMPLES.

1. What is the Cube-root of 115501303.?

115501303.(487
64

48)515 Dividend.

110592 Subtrahend

6912)49093 Dividend

115501303 Subtrahend

0

4 × 4 × 3 = 48 Diviſor
48 × 48 × 48 = 110592 Subtrahend
48 × 48 × 3 = 6912 Diviſor
487 × 487 × 487 = 115501303 Subtrahend

2. What is the Biquadrate-root of 56249134561.?

56249134561.(487
256

256)3064 Dividend

5308416 Subtrahend

442368) 3164774 Dividend

56249134561 Subtrahend

0

4 × 4 × 4 × 4 = 256 Diviſor
48 × 48 × 48 × 48 = 5308416 Subtrahend
48 × 48 × 48 × 4 = 442368 Diviſor
487 × 487 × 487 × 487 = 56249134561 Subtrahend

Note, This General Rule I received from my worthy Friend William Mountaine, Eſq; F. R. S. and Teacher of the Mathematics at Shad-Thames.

Of SIMPLE INTEREST.

Q. WHAT *particular Letters are uſed here?*

A. Theſe; *P*, any Principal.
T, the Time.
R, the Ratio of the rate *per cent.*
A, the Amount.

Q. *What is the Ratio?*

A. It ſignifies only the ſimple Intereſt of 1 *l.* for one Year at any propoſed rate of Intereſt *per Cent.* and is thus found;

$$\begin{array}{ccccccc} l. & & l. & & l. & & \\ 100 & : & 6 & :: & 1 & : & 0.06 \\ 100 & : & 5 & :: & 1 & : & 0.05, \&c. \end{array}$$

A TABLE *of* RATIOS.

Rate per Ct.	*Ratio*	*Rate per Ct.*	*Ratio*
2	.02	6½	.065
3	.03	7	.07
3½	.035	7½	.075
4	.04	8	.08
4½	.045	8½	.085
5	.05	9	.09
5½	.055	9½	.095
6	.06	10	.1

CASE I.

Q. *When* P, T, *and* R *are given to find* A, *how is it diſcovered?*

A. Thus, $ptr+p=a$.

Note, Any Quantity of Letters put together like a Word, denote continual Multiplication.

EXAMPLES.

1. What ſum will 567 *l.* 10 *s.* amount to in 9 Years at 6 *per cent per ann.*? *Anſw.* 873 *l.* 19 *s.*

2. What will 508 *l.* 14 *s.* amount to in 1 Year at 5 *per cent. per ann.*? *Anſw.* 534 *l.* 2 *s.* 8 *d.* 1.6 *qr.*

3. What will 600 *l.* 14 *s.* amount to in 10 Years, at 4½ *per cent. per ann.*? *Anſw.* 871 *l.* 0 *s.* 3 *d.* 2.4 *qrs.*

4. What will 4000 *l.* amount to in 5 Years, at 3½ *per cent. ann.*? *Anſw.* 4700 *l.*

Note, When the Time given, does not conſiſt of whole Years, then reduce the odd Time into Decimal Parts of a Year, and unleſs ſuch Parts of a Year chance to be juſt ¼, ½, or ¾, of a Year, the beſt way will be to reduce the odd times into Days, and then work with the decimal Parts of a Year, that are equivalent to thoſe Days.

A TABLE *for the ready finding the Decimal Parts of a Year equal to any Number of Days, or Quarters of a Year.*

Days.	*Decimal Pts.*	*Days.*	*Decimal Pts.*	*Days.*	*Decimal Pts.*
1	.00274	10	.027397	100	.273973
2	.005479	20	.054794	200	.547945
3	.008219	30	.082192	300	.821918
4	.010959	40	.109589	365	1.000000
5	.013699	50	.136986		
6	.016438	60	.164383		
7	.019178	70	.191781	¼ *of a Year*	.25
8	.021918	80	.219178	½ *of a Year*	.5
9	.024657	90	246575	¾ *of a Year*	.75

Note, When the true Number of Days cannot be found at one view in this Table, then both theſe and their Decimals muſt be taken out of the Table at twice or thrice, as their Number requires, and added together. So the Decimal Parts of a Year = 236 Days are thus found.

$$\begin{array}{r} 200=.547945 \\ 30=.082192 \\ 6=.016438 \\ \hline 236=.646575 \end{array}$$

EXAMPLES.

5. What will 7200*l.* amount to in 6½ Years, at 5 *per cent. per annum*? *Anſw.* 9540 *l.*

6. What will 1110 *l.* 18 *s.* amount to in 12¾ Years, at 5 *per cent. per annum*? *Anſw.* 1819 *l.* 1 *s.* 11 *d.* 2.8 *qrs.*

7. What will 280*l.* 10*s.* amount to in 3 Years and 148 days, at 5 *per cent. per annum*? *Anſw.* 328 *l.* 5 *s.* 2 *d.* 3.38 +*qrs.*

8. What will 196 *l.* amount to in 189 Days, at 4 *per cent. per ann.*? *Anſw.* 200 *l.* 1 *s.* 2 *d* 1.23+*qrs.*

CASE. 2.

Q. *When* A, T *and* R, *are given to find* P; *how is it diſcovered?*

A. Thus; $\dfrac{a}{tr+1}=p.$

EXAMPLES.

1. I demand what Principal will amount to 873 *l.* 19 *s.* in 9 Years at 6 *per cent. per ann.*? *Anſw.* 567 *l.* 10 *s.*

2 I demand what Principal will amount to 534 *l.* 2 *s.* 8 *d.* 1.6 *qr.* in a Year, at 5 *per cent. per ann.*? *Anſw.* 508 *l.* 14 *s.*

3. I demand what Principal will amount to 9540 *l.* in 6½ Years, at 5 *per cent per ann.*? *Anſw.* 7200 *l.*

4. I demand what Principal will amount to 1819 *l.* 1 *s.* 11 *d.* 2.8 *qrs.* in 12¾ Years, at 5 *per cent per ann.*? *Anſw.* 1110 *l.* 18 *s.*

5. I demand what Principal will amount to 871 *l.* 0 *s.* 3 *d.* 2.4 *qrs.* in 10 Years, at 4½ *per cent. per ann.*? *Anſ.* 600 *l.* 14 *s.*

6. I demand what Principal will amount to 4700 *l.* in 5 Years, at 3½ *per cent. per ann.*? *Anſw.* 4000 *l.*

7. I demand what Principal will amount to 328 *l.* 5 *s.* 2 *d.* 3.38 *qrs.* in 3 years and 148 Days at 5 *per cent.*? *Anſw.* 280 *l.* 10 *s.*

8. What Principal being put to Intereſt for 189 Days at 4 *per cent.* will amount to 200 *l.* 1 *s.* 2 *d.*½? *Anſw.* 196 *l.*

CASE 3.

Q. *When* A, P *and* T, *are given to find* R, *how is it diſcovered?*

A. Thus;

$$\frac{a-p}{tp}=r$$

EXAMPLES.

1. At what Rate *per cent.* will 567 *l.* 10 *s.* amount to 873 *l.* 19 *s.* in 9 Years? *Anſw.* 6 *l. per cent.*

2. At what rate *per cent.* will 508 *l.* 14 *s.* amount to 534 *l.* 2 *s.* 8 *d* 1.6 *qr.* in 1 Year? *Anſw.* 5 *l. per cent.*

3. At what rate *per cent.* will 7200 *l.* amount to 9540 *l.* in 6½ Years? *Anſw.* 5 *l. per cent.*

4. At what rate *per cent.* will 1110 *l.* 18 *s.* amount to 1819 *l* 1 *s.* 11 *d.* 2.8 *qr.* in 12¾ Years? *Anſw.* 5 *l. per cent.*

5. At what rate *per cent.* will 600 *l.* 14 *s.* amount to 871 *l.* 0 *s.* 3 *d.* 2.4 *qrs.* in 10 Years? *Anſw.* 4½ *per cent.*

6. At what rate *per cent.* will 4000 *l.* amount to 4700 *l.* in 5 Years? *Anſw.* 3½ *per cent.*

7. At what rate *per cent.* will 280 *l.* 10 *s.* amount to 328 *l.* 5 *s.* 2 *d.* 3.38 *qrs.* in 3 Years and 148 Days? *Anſw.* 5 *l. per cent.*

8. At what rate *per cent.* will 196 *l.* amount to 200 *l.* 1 *s.* 2 *d.*½, in 189 Days? *Anſw.* 4 *l. per cent.*

CASE 4.

Q. *When* A, P, *and* R, *are given to find* T, *how is it diſcovered?*

A. Thus;

$$\frac{a-p}{rp}=t.$$

EXAMPLES.

1. In what time will 567 *l.* 10 *s.* amount to 873 *l.* 19 *s.* at 6 *per cent.*? *Anſw.* 9 *Years.*

2. In what time will 508 *l.* 14 *s.* amount to 534 *l.* 2 *s.* 8 *d.* 1.6 *qr.* at 5 *per cent.*? *Anſw.* 1 *Year.*

3. In what time will 7200 *l.* amount to 9540 *l.* at 5 *per cent.*? *Anſw.* 6½ *Years.*

4. In what time will 1110 *l.* 18 *s.* amount to 1819 *l.* 1 *s,* 11 *d.* 2.8 *qrs* at 5 *per cent.*? *Anſw.* 12¾ *Years.*

5. In what time will 600 *l.* 14 *s.* amount to 871 *l.* 0 *s.* 3 *d.* 2.4 *qrs.* at 4½ *per cent*? *Anſw.* 10 *Years.*

6. In what time will 4000 *l.* amount to 4700 *l.* at 3½ *per cent.*? *Anſw.* 5 *Years.*

7. In what time will 280 *l.* 10 *s.* amount to 328 *l.* 5 *s.* 2 *d.* 3.38 *qrs.* at 5 *per cent*? *Anſw.* 3 *Years* and 148 *Days.*

8. In what time will 196 *l.* amount to 200 *l,* 1 *s.* 2 *d.*½, at 4 *per cent*? *Anſw.* 189 *Days.*

Of ANNUITIES *or* PENSIONS *in* ARREARS.

Q. *What is meant by Annuities or Penſions in Arrears?*

A. Annuities or Penſions are ſaid to be in Arrears, when they are payable, either yearly, half-yearly, or quarterly, and are unpaid for any Number of Payments.

Note, U repreſents the Annuity, Penſion, &c. R, T, and A as before.

CASE 1.

Q. *When* U, R, *and* T, *are given to find* A; *how is it diſcovered?*

A. Thus; $\frac{tut - tu}{2} \times r : + tu = a.$

EXAMPLES.

1. If an Annuity of 70 *l* be forborn 5 years, what will it amount to in that time at 5 *per cent*? *Anſw.* 385 *l.*

2. If the Payment of a Penſion be omitted for 7 years; what will be the amount in that time, at 6 *l. per cent.* when the Penſion is 56 *l. per annum*? *Anſw.* 462 *l.* 11 *s.* 2 *d.* 1.6 *qr.*

3. An Houſe is let upon Leaſe for 7 years at 50 *l. per ann.* I demand the amount for that time at 4 *l. per cent.* for the forbearance of Payment? *Anſw.* 392 *l.*

4. Suppoſe a Salary of 100 *l. per ann.* be forborn 7 years, what is the Amount at 4½ *per cent*? *Anſw.* 794 *l.* 10 *s.*

Note, When the Annuities or Rents are to be paid by half-yearly or quarterly Payments, as moſt generally they are, then

For half-yearly Payments, take (always) half of the Ratio, half of the yearly Rent, and twice the Number of Years; that is, Reduce the Years into half years, for R, U, and T; But,

For quarterly Payments, take a fourth Part of the Ratio, a fourth Part of the Yearly Rent, and four times the Number of Years; that is, Reduce the Years into Quarters, and work as before.

5. If 70 *l.* Annuity payable every half year, were unpaid 5 years; what will it amount to in that time, at 5 *per cent*? *Anſw.* 389 *l.* 7 *s.* 6 *d.*

6. If 70 *l.* Annuity payable every Quarter, were unpaid 5 Years; what will it amount to in that time at 5 *per cent*? *Anſw.* 391 *l.* 11 *s.* 3 *d*

Note, By comparing theſe two Examples with the firſt, it may be obſerved that the Amount of half-yearly Payments is more advantageous than yearly Payments; and quarterly, than half yearly Payments.

CASE 2.

Q. *When* A, R, *and* T, *are given to find* U; *how is it diſcovered*?

A. Thus; $\frac{2a}{trt-tr+2t}=u$.

EXAMPLES.

1. If the Amount of an Annuity for 5 years at 4 *per cent.* be 385 *l.* what is the Annuity? *Anſw.* 70 *l.*

2. If the Amount of a Penſion be 462 *l.* 11 *s.* 2 *d.* 1.6 *qr.* the time be 7 years, and the rate *per cent.* 6 *l.* what is the Penſion? *Anſw.* 56 *l.*

3. If an Houſe be let upon Leaſe for 7 years, and the Amount for that time be 392 *l.* at 4 *per cent* what is the yearly rent? *Anſw.* 50 *l.*

4. If a Salary amounts to 794 *l.* 10 *s.* in 7 years, at 4½ *per cent* what is the Salary? *Anſw.* 100 *l. per ann.*

Note, When the Payments are half yearly, 4a muſt be divided; but when they are quarterly, then 8a muſt be divided as before.

5. If the amount of an Annuity, payable half-yearly for 5 *yrs.* at 5 *per C.* be 389 *l.* 7 *s.* 6 *d.* what is the Annuity? *Anſw.* 70 *l.*

6. If the amount of an Annuity, payable quarterly for 5 *yrs.* at 5 *per C.* be 391 *l.* 11 *s.* 3 *d.* what is the Annuity? *Anſw.* 70 *l.*

CASE 3.

Q. *When* U, A, *and* T, *are given to find* R; *how is it diſcovered*?

A. Thus; $\frac{2a-2ut}{utt-ut}=r$

EXAMPLES.

1. If an Annuity of 70 *l. per ann.* amounts to 385 *l.* in 5 years; I demand the rate *per cent*? *Anſw.* 5 *l.*

2. If a Penſion of 59 *l. per ann.* amounts to 462 *l.* 11 *s.* 2 *d.* 1.6 *qr.* in 7 years; what is the rate *per cent*? *Anſw.* 6 *l.*

3. If an Houſe be let upon Leaſe for 7 Years, at 5 *l. per ann.* and the Amount for that time be 392 *l.* what is the rate *per cent*? *Anſw* 4 *l. per cent.*

4. If a Salary of 100 *l. per ann.* being forborn 7 years amounts to 794 *l.* 10 *s.* I demand the rate *per cent*? *Anſ.* 4½.

Note, When the Payments are half-yearly, then 4a—4ut muſt be divided; but when they are quarterly, then 8a—8ut muſt be divided as before.

5. If an Annuity of 70 *l per ann.* payable half-yearly, being forborn 5 years, amounts to 389 *l.* 7 *s.* 6 *d.* I demand the rate *per cent* ? *Anſw* 5 *l. per cent.*

6. If an Annuity of 70 *l. per ann* payable quarterly, amounts to 391 *l.* 11 *s.* 3 *d.* in 5 years; I demand the rate *per cent* ? *Anſw.* 5 *l. per cent.*

CASE 4.

Q. *When* U, A, *and* R, *are given to find* T; *how is it diſcovered?*

A. Thus; Firſt $\frac{2}{r} - 1 = x$.

Secondly $\sqrt{\frac{2a}{ru} + \frac{xx}{4}} : - \frac{1}{2}x = t$.

EXAMPLES.

1. In what time will 70 *l. per ann.* amount to 385 *l.* forborn at 5 *per cent* ? *Anſw.* 5 *years.*

2. In what time will a Penſion of 56 *l. per ann.* amount to 462 *l.* 11 *s.* 2 *d.* 1.6 *qr* at 6 *per cent* ? *Anſw* 7 *years.*

3. If an Houſe be let upon Leaſe, for a certain time, for 50 *l. per ann.* and the Amount be 392 *l.* at 4 *per cent.* I demand the time that it was let for? *Anſw.* 7 *years.*

4. If a Salary of 100 *l. per ann.* being forborn a certain time, amount to 794 *l.* 10 *s.* at 4½ *per cent.* I demand the time of forbearance? *Anſw.* 7 *years.*

Note, If the Payments were half-yearly, then T will be equal to the Number of half years, or Payments; but if they were to be made quarterly, then T will be equal to the Number of quarterly Payments.

5. If an Annuity of 70 *l. per ann.* payable half-yearly, being forborn, amounts to 389 *l.* 7 *s.* 6 *d.* at 5 *per cent.* I demand the time and Payments forborn? *Anſw.* 10 *Payments* = 5 *years.*

6. If an Annuity of 70 *l. per ann.* payable quarterly, being forborn, amount to 391 *l.* 11 *s.* 3 *d.* at 5 *per cent.* I demand the time and Payments forborn? *Anſw.* 20 *Payments* = 5 *years.*

Of the PRESENT WORTH *of* ANNUITIES *or* PENSIONS, *&c.*

Note, P repreſents the preſent Worth; U, T, and R, as in the laſt.

CASE 1.

Q. *When* U, T *and* R, *are given to find* P; *how is it diſcovered?*

A. Thus; $\frac{rtt - rt + 2t}{2rt + 2} : \times u = p$.

EX-

EXAMPLES.

1. What is the preſent Worth of 50 *l. per Ann.* to continue 6 Years at 5 *per Cent.* *Anſw* 259 *l.* 12 *s* 3 *d.* 2.4+*qrs.*

2. What is 80 *l.* yearly Rent, to continue 5 Years, worth in ready Money, at 6 *per Cent.*? *Anſw.* 344 *l.* 12 *s.* 3 *d.* 2.5+*qrs.*

3. What is a Salary of 40 *l. per Ann.* to continue 7 Years, worth in ready Money at 4 *per Cent.*? *Anſw.* 245 *l.*

4. What is a Penſion of 30 *l. per Ann* for 5 Years, worth in ready Money at 4½ *per Cent.*? *Anſw.* 133 *l.* 9 *s.* 4 *d.*2.6+*qrs.*

Note, Obſerve the ſame Note here, which is given in Caſe 1. in Annuities and Penſions in Arrears, concerning half-yearly and quarterly Payments.

5. What is the preſent Worth of 50 *l. per Ann.* payable half-yearly for 6 Years, at 5 *per Cent.*? *Anſw.* 262 *l.* 10 *s.*

6. What is the preſent Worth of 50 *l. per Ann.* payable quarterly for 6 Years, at 5 *per Cent.*? *Anſw.* 263 *l.* 18 *s.* 9 *d.* 3.6 *qrs.*

Note, By comparing theſe two Examples with the firſt, it may be obſerved, that the preſent Worth of half yearly Payments, is more advantageous than yearly Payments, and the preſent Worth of quarterly than half-yearly Payments.

CASE 2.

Q. *When* P, T, *and* R, *are given to find* U; *how is it diſcovered?*

A. Thus:
$$\frac{rt+1}{rtt-rt+2t} : \times 2p = u$$

EXAMPLES.

1. There is a Leaſe of an Houſe 6 Years to come; I demand the yearly Rent, when the preſent Worth, at 5 *per Cent.* is 259 *l.* 12 *s.* 3 *d.* 2 *qrs.*? *Anſw.* 50 *l. per Ann.*

2. What yearly Rent is that, the preſent Worth of which for 5 Years is 344 *l.* 12 *s.* 3 *d.* 2 *qrs.* at 6 *per C.*? *Anſw.* 80 *l. per Ann.*

3. What Salary is that which for 7 Years continuance at 4 *per C.* produces 245 *l.* for the preſent Worth? *Anſw.* 40 *l. per Ann.*

4. If the preſent Worth of a Penſion to continue 5 Years at 4½ *per C.* be 133 *l.* 9 *s.* 4 *d.* 3 *qrs.* I demand the Penſion? *Anſw.* 30 *l.*

Note, When the Payments to be made are half-yearly, you muſt multiply by 4p; but when they are quarterly, then multiply by 8p to find u.

5. There is a Leaſe of a Houſe, payable half-yearly, for 6 Years to come; I demand the yearly Rent, when the preſent Worth at 5 *per Cent.* is 262 *l.* 10 *s.*? *Anſw.* 50 *l.*

6. There is a Leaſe of an Houſe, payable quarterly, for 6 Years to come; I demand the Yearly Rent, when the preſent Worth at 5 *per Cent.* is 263 *l.* 18 *s.* 9 *d.* 3.6 *qrs*? *Anſw.* 50 *l.*

CASE 3.

Q. *When* U, P, *and* T, *are given to find* R; *how is it diſcovered?*

A. Thus; $\frac{2ut-2p}{2p-\sqrt{utt-ut}}=r$.

EXAMPLES.

1. I demand at what Rate *per Cent.* will the yearly Rent of 50*l.* to continue 6 Years, produce the preſent Worth of 259*l.* 12*s.* 3*d.* 2*qrs*? *Anſw.* 5 *l. per Cent.*

2. If the yearly Rent of 80 *l. per Ann.* to continue 5 Years, bring 344 *l.* 12 *s.* 3 *d.* 2 *qrs.* preſent Worth; what is the Rate *per Cent.*? *Anſw.* 6 *l. per Cent.*

3. If a Salary of 40 *l. per Ann.* to continue 7 Years, produce 245 *l.* for the preſent Worth; what is the Rate *per Cent.*? *Anſw.* 4 *l. per Cent.*

4 If a Penſion of 30 *l. per Ann.* to continue 5 Years, produce 133 *l.* 9 *s.* 4 *d.* 2 *qrs.* for the preſent Worth; what is the Rate *per Cent.* *Anſw.* 4 ½ *l. per Cent.*

Note, When the Annuities, or Rents, are to be paid half-yearly or quarterly, then

For half-yearly Payments, take half of the annuity or yearly Rent, and twice the Number of Years, that is, Reduce the Years into half Years, and then the Quotient of the upper Part divided by the lower, will be the Ratio of half the Rate per Cent. But,

For quarterly Payments, take a fourth Part of the Annuity or yearly Rent, and four Times the Number of Years, that is, Reduce the Years into Quarters; and then the Quotient of the upper Part divided by the lower, will be the Ratio of a fourth Part of the Rate per Cent.

5. A Leaſe of an Houſe of 50 *l. per ann.* payable half-yearly, having 6 Years to come, is ſold for 262 *l.* 10 *s.* I demand the Rate *per Cent.* *Anſw.* 5 *l. per Cent.*

6. A Leaſe of an Houſe of 50 *l. per ann.* payable quarterly, having 6 Years to come, is ſold for 263 *l.* 18 *s.* 9 *d.* 3 *qrs.* I demand the Rate *per Cent.*? *Anſw.* 5 *l. per Cent.*

CASE 4.

Q. *When* U, P, *and* R *are given to find* T; *how is it diſcovered?*

A. Thus; Firſt, $\frac{2}{r}-\frac{2p}{u}-1=x$

Secondly, $\sqrt{\frac{2p}{ru}+\frac{xx}{4}:\frac{x}{2}}=t$.

EXAM-

EXAMPLES.

1. If 50*l.* yearly Rent produce the preſent Worth of 259*l.* 12 *s.* 3 *d.* 2 *qrs.* at 5 *per Cent.* what is the Time of its Continuance? *Anſw.* 6 *Years.*

2. I demand how long 80 *l. per Ann.* may be purchaſed for 344 *l.* 12 *s.* 3 *d.* 2 *qrs.* at 6 *per Cent.*? *Anſw.* 5 *Years.*

3. How long muſt a Salary of 40 *l. per Ann.* be enjoyed for 245 *l.* at 4 *per Cent.*? *Anſw.* 7 *Years.*

4. What Time may a Penſion of 30 *l. per Ann.* be bought for 133 *l.* 9 *s.* 4 *d.* 2 *qrs.* at 4 ½ *per Cent.*? *Anſw.* 5 *Years.*

Note 1. If the Payments are to be half yearly, then U will be=half of the given Leaſe, Penſion, &c. and R will be=half of the Ratio of the given Rate; and T which is required, will be=the Number of Payments or half-years.

2. If the Payments are to be quarterly, then U will be =a fourth Part of the given Leaſe, Penſions, &c. and R will be=a fourth Part of the Ratio of the given Rate; and T will be the Number of quarterly Payments.

5. A Leaſe of an Houſe of 50*l. per Ann.* payable half-yearly, is ſold for 262 *l.* 10 *s.* at 5 *per Cent.* I demand the Number of Payments, and the Time to come? *Anſw.* 12 *Payments*=6 *yrs*

6. A Leaſe of an Houſe of 50 *l. per Ann.* payable quarterly, is ſold for 263 *l.* 18 *s* 9 *d.* 3 *qrs.* at 5 *per Cent.* I demand the Number of Payments, and the Time to come? *Anſw.* 24 *Payments*=6 *Years.*

Of ANNUITIES, LEASES, *&c. taken in* REVERSION.

CASE 1.

Q. *How do you find the preſent Worth of an Annuity, &c. in Reverſion?*

A. Thus: 1*ſt*, Find the preſent Worth of the yearly Sum at the given Rate, and for the Time of its Continuance; to do which, there are given *U*, *T*, and *R*, to find *P*, which is thus diſcovered:

$$\frac{rtt-rt+2t}{2rt+2} : \times u = p.$$

2*dly*, Find what Principal being put to Intereſt will amount to *P*, at the ſame Rate, and for the Time to come before the Annuity, &c commences; and that will be the preſent Worth of the Annuity, &c. in Reverſion:. Therefore let *P* be changed into *A*=the Amount, and then there will be given *A*, *R*, and *T*, to find *P*, or the Principal, which is thus diſcovered;

$$\frac{a}{tr+1} = p.$$

EXAM-

EXAMPLES.

1. What is the preſent Worth of a Leaſe of 30 *l. per Ann.* to continue 3 Yrs. ; but is not to commence till the End of 2 Yrs. allowing 4 *per Cent.* to the Purchaſer? *Anſw.* 77*l.* 7*s.* 7,2*d.*

2. I have the promiſe of a Penſion of 17*l per A.* for 7 Years. but it does not commence till the End of 4 Years ; and I am willing to diſpoſe of the ſame for preſent Payment, at the Rate of 5 *per C.* I demand the preſent Worth? *Anſw.* 84*l* 9*s.* 6*d.*

3. There is a Legacy of 20 *l. per A.* for 8 Years. left to a Perſon of 16 years of Age ; the time of Payment is to commence at the year of Perfection, *i e.* at 21 Years ; but he wanting a ſum of Money is minded to ſell the ſame at 4 *per C.* I demand the preſent Worth? *Anſw.* 115*l* 3*s.* 0*d* 1 44*qr.*

4. A good-natured Gentleman, being minded to beſtow a Favour upon an unthankful Wretch, ſettled upon him an Income of 35*l. per A.* for 12 years, to commence 5 years after ſuch ſettlement ; but he wanting money to follow his extravagances, ſold it at the rate of 10 *per C.* I demand how much he received for the preſent worth? *Anſw* 197 *l.* 5 *s.* 5 *d.* 1.792 *qr.*

CASE 2.

Q. *How do you find the yearly income of an Annuity,* &c. *in Reverſion?*

A. Thus: 1*ſt*, Find the amount of the preſent Worth of the yearly Sum, at the given Rate, and for the Time before the Reverſion ; to do which, there are given *P*, *T*, and *R*, to find *A*, which is thus diſcovered ;

$$ptr+p=a.$$

2*dly*, Find what yearly Rent being ſold, will produce *A*, for the preſent Worth, at the ſame Rate, and for the Time of its Continuance ; and that will be the yearly Sum required: Therefore change *A* into *P*, and there will be given *P*, *R*, and *T*, to find *U*, or the yearly Sum, thus ;

$$\frac{rt+1}{rtt-rt+2t} : \times 2p=u.$$

EXAMPLES.

1. There is a Leaſe of an Houſe taken for 3 yrs. but commences not till the end of 2 yrs. and the Leſſee would ſell the ſame for 77*l.* 7*s.* 7.2*d.* preſent Payment, allowing 4 *per C.* to the Purchaſer ; I demand the yearly Rent? *Anſw.* 30*l. per Ann.*

2. I have the promiſe of a Penſion for 7 years, which will not commence till the end of 4 yrs ; and I have diſpoſed of the ſame for the preſent Payment of 84 *l.* 9 *s.* 6 *d.* allowing 5 *per C.* to the Purchaſer; I demand the yearly Income? *Anſw.* 17 *l.*

3. There is a Legacy of a certain Rate *per ann.* for 8 *yrs.* left to a Perſon of 16 *yrs.* of Age; but the Time of Payment muſt not commence till the Age of Perfection; and the ſame Perſon wanting a ſum of Money, ſold it for 115*l.* 3*s.* 0*d.* 2*qrs.* allowing 4 *per C.* to the Buyer; I demand the yearly Rate? *Anſw.* 20 *l.*

4. A good-natured Gentleman, being minded to beſtow a Favour upon an unthankful Wretch, ſettled an Income upon him for 12 years, at a certain Rate *per ann.* to commence 5 years after ſuch Settlement; but he wanting Money to follow his Extravagance, ſold it for 197 *l.* 5 *s.* 5 *d.* 2 *qrs.* allowing 10 *per C.* to the Buyer for preſent Payment; I demand the yearly Value? *Anſw.* 35 *l.*

Of SIMPLE INTEREST *for* DAYS.

Q. *How do you find the Simple Intereſt of any Sum of Money, for any Number of Days?*

A. Multiply the Intereſt of one Pound for one Day, at the given Rate, by the Principal, and by the Number of Days; the laſt Product is the Intereſt required.

Note, The Intereſt of one Pound for one Day at

1	per Cent.	is = .00002739726
2		is = .00005479452
3		is = .00008219178
4		is = .00010958904
5		is = .0001369863
6		is = .00016438356
7		is = .00019178082
8		is = .00021917808
9		is = .00024657534
10		is = .0002739726

EXAMPLES.

1. What is the Intereſt of 120*l.* for 126 Days, at 4 *per Cent.*? *Anſw.* 1 *l.* 13 *s.* 1 *d.* 2 *qrs.*—

2. What is the Intereſt of 126 *l.* for 145 Days, at 6 *per Cent.*? *Anſw.* 3 *l.* 0 *s.* 0 *d.* 3 *qrs.*+

3. What is the Intereſt of 100 *l.* from the 1ſt of June 1764, to the 8th of March following, at 5 *per Cent.*? *Anſw.* 3 *l.* 16 *s.* 11 *d.* 3 *qrs.*

4. What is the Intereſt of 200 *l.* from the 14th of Auguſt, 1764, to the 19th of December following, at 6 *per Cent.*? *Anſw.* 4 *l.* 4 *s.* 1 *d.* 3 *qrs.* +

5. What is the Intereſt of 10 *l.* for 25 Days, at 5 *per C.*? *Anſw.* 8 *d* +

6. What is the Intereſt of 40 *l.* for 40 Days, at 4 *per C.*? *Anſw.* 3 *s.* 6 *d.*+

Note, There is another Way of anſwering Queſtions in Intereſt for Days, which is laid down in Caſe 1, in Simple Intereſt, Page 132, as appears by the 8th Queſtion in that Caſe. The Reader may uſe which he likes beſt; or both if he pleaſes.

Of REBATE *or* DISCOUNT.

Q. *What particular Letters are uſed in Rebate?*

A. Theſe:

S, The Sum to be diſcounted.

P, The preſent Worth of that Sum, due at any Time to come.

T, The Time before it becomes due.

R, The Ratio, or the Rate per Cent.

CASE 1.

Q. *When* S, T, *and* R, *are given to find* P, *how is it diſcovered?*

A. Thus: $\frac{s}{tr+1}=p.$

EXAMPLES.

1. What is the preſent Worth of 795 *l.* 11 *s.* 2 *d.* for 11 Months at 6 *per Cent*? *Anſw.* 754 *l.* 1 *s.* 8 *d.*+

2. What is the preſent Worth of 161 *l.* 10 *s.* for 19 Months, at 5 *per Cent.*? *Anſw.* 149 *l.* 13 *s.* 0 *d.* 3 *qrs.*+

3. If a Legacy of 1000 *l.* is left me the 24th of July, 1771, to be paid on the Chriſtmas-Day following; what muſt I receive when I allow 6 *per Cent.* for preſent Payment? *Anſw.* 975 *l.* 3 *s.* 0 *d.* 3 *qrs.*+

CASE 2.

Q. *When* P, T, *and* R, *are given to find* S; *how is it diſcovered?*

A. Thus: $ptr+p=s.$

EXAMPLES.

1. Suppoſe I receive 754 *l.* 1 *s.* 8 *d.* now, for a Sum of Money, due 11 Months hence, allowing 6 *per Cent.* for preſent Payment; I demand the Sum that was due at firſt? *Anſw.* 795 *l.* 11 *s.* 2 *d.*

2. There is a certain Debt, payable 19 Months hence; but I agree with the Debtor to pay me down 149 *l.* 13 *s.* 0 *d*¼. and allow him 5 *per Cent.* for preſent Payment; I demand how much the Debt is? *Anſw.* 161 *l.* 10 *s.*

3. A Legacy was left me the 24th of July, 1771, to be paid on the Chriſtmas-Day following; but I agree with the Executor, and allow him 6 *per Cent.* for the preſent Payment of 975 *l.* 3 *s.* 0 *d.* 3 *qrs.* I demand what the Legacy was? *Anſw.* 1000 *l.*

CASE 3.

Q. *When* S, P, *and* R, *are given to find* T; *how is it diſcovered?*

A. Thus: $\frac{s-p}{rp}=t.$

EXAM-

EXAMPLES.

1. The preſent Worth of 795 *l.* 11 *s.* 2 *d.* due for a certain Time to come, is 754*l.* 1*s.* 8*d.* at 6 *per Cent.* I demand in what time the firſt Sum ſhould have been paid, if no Rebate had been made? *Anſw.* 11 *Months.*

2. There is 161 *l.* 10*s.* due at a certain Time to come, but I allow 5 *per Cent.* to the Debtor, for the preſent Payment of 149 *l.* 13 *s.* 0 *d.* 3 *qrs.* I demand when the Sum ſhould have been paid without any Rebate? *Anſw* 19 *Months.*

3. I have received 975 *l.* 3 *s.* 0*d.* 3 *qrs.* for a Legacy of 1000*l.* allowing the Executor 6 *per Cent.* I demand when the Legacy was payable without Rebate? *Anſw.* 155 *Days.*

CASE 4.

Q. *When* S, P, *and* T, *are given to find* R; *how is it diſcovered?*

A Thus: $\frac{s-p}{tp}=r.$

EXAMPLES.

1. At what Rate *per Cent.* will 795 *l.* 11 *s.* 2 *d.* payable 11 Months hence, produce 754 *l.* 1 *s.* 8 *d.* for preſent Payment? *Anſw.* 6 *per Cent.*

2. At what Rate *per Cent.* will 161 *l.* 10 *s.* payable 19 Months hence, produce the preſent Payment of 149 *l.* 13 *s.* 0 *d.* 3 *qrs.*? *Anſw.* 5 *per Cent.*

3. Suppoſe a Legacy of 1000 *l.* is left me the 24th of July, 1771, to be paid on the Chriſtmas-Day following; but I agree with the Executor for the preſent Payment of 975 *l.* 3 *s.* 0 *d.* 3 *qrs.* I demand the Rate *per Cent.* allowed for his Money? *Anſw.* 6 *per Cent.*

Of EQUATION *of* PAYMENTS *(the true Way).*

Q. *How is the equated Time for the Payment of a Sum of Money, due at ſeveral Times, found out?*

A. Thus: 1. Find the preſent Worth of each Payment for its reſpective Time, as in Rebate, that is,

$$\frac{s}{tr+1}=p.$$

2. Add all the preſent Worth together, and call that Sum alſo *P*; then is $s-p=d$ the Rebate.

3. $\frac{d}{pr}=e$ is the true equated Time.

EXAMPLES.

1. *A.* owes *B.* 200 *l.* to be paid as follows, *viz.* 100 *l.* at 2 Months; and 100 *l* at 4 Months; but they agree to have but one Payment of the Whole, Rebate being made at 6 *per Cent.* I demand the true equated Time? *Anſw.* 3 *Months.*

2. A Merchant hath owing him 300 *l* to be paid as follows: 50 *l.* at 2 Months, 100 *l.* at 5 Months, and the reſt at 8 Months; and it is agreed to make but one Payment of the Whole, Rebate being made at 5 *per Cent.* I demand the equated Time? *Anſw.* 5.9796 *Months.*

3. *F* owes to *H* 1000*l.* whereof 200*l.* is to be paid at preſent, 400*l.* at 5 Months; and the reſt at 10 Months; but they agree to have but one Payment of the Whole, at the Rate of 4 *per C.* Rebate; I demand the true equated Time? *Anſw.* 181 *Days.*

4. A Man owes to a Merchant 1200 *l.* to be paid as follows, 200 *l.* down; 500 *l.* at the End of 10 Months; and the reſt at the End of 20 Months; and they agree to have but one Payment of the Whole, Rebate at 3 *per Cent.* I demand the true equated Time? *Anſw.* 1 *Year*, 11 *Days.*

Of COMPOUND INTEREST.

Q. *WHAT particular Letters are uſed here?*

A. Theſe:

P, the Principal;
T, the Time;
R, the Amount of 1 *l.* for 1 Year, at any given Rate;
A, the whole Amount.

Q. *How is the Amount of* 1 *l. for* 1 *Year, at any propoſed Rate per Cent. found?*

A. Thus: As 100 : 106 : : 1 : 1.06
100 : 105 : : 1 : 1.05, *&c.*

A TABLE of the AMOUNTS of 1 *l.* for 1 Year.

Rates *per Ct.*	Amts. of 1*l.*	Rates *per Ct.*	Amts. of 1*l.*
2	1.02	6½	1.065
3	1.03	7	1.07
3½	1.035	7½	1.075
4	1.04	8	1.08
4½	1.045	8½	1.085
5	1.05	9	1.09
5½	1.055	9½	1.095
6	1.06	10	1.1

CASE

CASE 1.

Q. *When* P, T, *and* R, *are given to find* A; *how is it diſcovered?*

A. Thus; $p \times r^{t} = a$.

Note, R muſt be involved ſo many times as the Number of years direct, and that will be r^{t}

EXAMPLES.

1. What ſum will 450 *l.* amount to in three years time, at 5 *per cent. per ann*? *Anſw.* 520 *l.* 18 *s.* 7 *d.* 2 *qrs.*

2. What will 400 *l.* amount to in 4 years, at 6 *per cent. per ann.*? *Anſw.* 504 *l.* 19 *s.* 9 *d.* 3.15264 *qrs.*

3. What will 480 *l.* amount to in 6 years, at 5 *per cent. per ann.*? *Anſw.* 643 *l.* 4 *s.* 11.0178 *d.*

4. What is the amount of 500 *l.* at 4½ *per cent. per ann.* for 4 years? *Anſw.* 590 *l.* 11 *s.* 5 *d.* 2.95+*qrs.*

CASE 2.

Q. *When* A, R, *and* T, *are given to find* P; *how is it diſcovered?*

A. Thus; $\dfrac{a}{r^{t}} = p$

EXAMPLES.

1. What Principal muſt be put to Intereſt, to amount to the ſum of 520 *l.* 18 *s.* 7 *d.* 2 *qrs.* in 3 years, at 5 *per cent. per ann.*? *Anſw.* 450 *l.*

2. What Principal will amount to 504 *l.* 19 *s.* 9 *d.* 3.15264 *qrs.* in 4 years, at 6 *per cent. per ann.*? *Anſw.* 400 *l.*

3. What Principal will amount to 643 *l.* 4 *s.* 11.0178 *d.* in 6 years, at 5 *per cent. per ann.*? *Anſw.* 480 *l.*

4. What Principal will amount to 590 *l.* 11 *s.* 5 *d.* 3 *qrs.* in 4 years, at 4½ *per cent. per ann.*? *Anſw.* 500 *l.*

CASE 3.

Q. *When* P, R, *and* A, *are given to find* T; *how is it diſcovered?*

A. Thus; $\dfrac{a}{p} = r^{t}$ which being continually divided by *r*, till nothing remains, the Number of thoſe Diviſions will be $= t$.

EXAMPLES.

1. In what time will 450 *l.* amount to 520 *l.* 18 *s.* 7 *d.* 2 *qrs.* at 5 *per cent. per ann.*? *Anſw.* 3 *years.*

2. In what time will 400 *l.* amount to 504 *l.* 19 *s.* 9 *d.* 3.2 *qrs.* at 6 *per cent. per ann.*? *Anſw.* 4 *years.*

3. In what time will 480 *l.* amount to 643 *l.* 14 *s.* 11 *d.* at 5 *per cent. per ann* ? *Anſw.* 6 *years.*

4. In what time will 500 *l.* amount to 590 *l.* 11 *s.* 5 *d.* 3 *qrs.* at 4½ *per cent. per ann.* ? *Anſw.* 4 *years.*

CASE 4.

Q. *When* P, A, *and* T, *are given to find* R, *how is it diſcovered?*

A. Thus; $\frac{a}{p}\,{}^{t}\!=r$ which muſt be extracted by the Rules of Extraction; the time given in the Queſtion $=t$, ſhewing the Power.

EXAMPLES.

1. At what rate *per cent.* will 450 *l.* amount to 520 *l.* 18 *s.* 7 *d.* 2 *qrs.* in 3 years? *Anſw.* 5 *per cent.*

2. At what rate *per cent.* will 400 *l* amount to 504 *l.* 19 *s.* 9 *d.* 3.2 *qrs.* in 4 years? *Anſw.* 6 *per cent.*

3. At what rate *per cent.* will 480 *l.* amount to 643 *l.* 4 *s.* 11.1 *d.* in 6 years? *Anſw.* 5 *per cent*

4. At what rate *per cent.* will 500 *l.* amount to 590 *l.* 11 *s.* 5 *d.* 3 *qrs.* in 4 years? *Anſw.* 4½ *per cent.*

Of ANNUITIES *or* PENSIONS *in* ARREARS.

CASE 1.

Note, U repreſents the Annuity, Penſion, &c. T, R, and A, as before.

Q. *When* U, T, *and* R, *are given to find* A; *how is it diſcovered?*

A. Thus; $\frac{ur^{t}-u}{r-1}=a.$

EXAMPLES.

1. What will an Annuity of 30 *l. per ann.* payable yearly, amount to in 4 years, at 5 *per cent*? *Anſw.* 129 *l.* 6 *s.* 0 *d* 3.6 *qrs.*

2. Suppoſe a Penſion of 50 *l. per ann.* payable yearly, be granted to a ſuperannuated Officer; what is the amount for 5 years forbearance at 4 *per cent.*? *Anſw.* 270 *l.* 16 *s.* 3 *d.* 3.4 + *qrs.*

3. If the yearly Rent of an Houſe which is 40 *l.* be forborn 7 years at 6 *per cent.* what is the amount? *Anſw.* 335 *l.* 15 *s.* 0 *d.* 3.3 + *qrs.*

4. If a Salary of 35 *l per ann.* to be paid yearly, be omitted for 6 years at 5½ *per cent.* what is the amount? *Anſw.* 241 *l.* 1 *s.* 7 *d.* 2.5 + *qrs.*

CASE 2.

Q. *When* R, T, *and* A, *are given to find* U, *how is it diſcovered?*

A. Thus; $\frac{ra-a}{r^{t}-1}=u.$

EXAMPLES.

1. What annuity being forborn for 4 years, will amount to 129 *l.* 6 *s.* 1 *d.* at 5 *per cent.* *Anſw.* 30 *l.* *per ann.*

2. If a Penſion being forborn for 5 years, at 4 *per cent. per ann* amounts to 270 *l.* 16 *s.* 4 *d.* I demand how much it is *per ann.*? *Anſw.* 50 *l.* *per ann.*

3. If the yearly rent of an houſe, being forborn for 7 years, at 6 *per cent.* amounts to 335 *l.* 15 *s.* 0 *d.* 3.4 *qrs.* I demand what the Rent is? *Anſw.* 40 *l.* *per ann.*

4. If the payment of a ſalary be omitted 6 years; I demand how much the ſalary is, when the amount is 241 *l.* 1 *s.* 7 *d.* 2.6 *qrs.* at 5½ *per cent.*? *Anſw.* 35 *l.* *per ann.*

CASE 3.

Q. *When* U, A, *and* R, *are given to find* T, *how is it diſcovered?*

A. Thus: $\frac{ar+u-a}{u}=r^{t}$ which being continually divided by *r*, till nothing remains, the number of thoſe diviſions will be $=t$.

EXAMPLES.

1. In what time will 30 *l.* *per ann.* amount to 129 *l.* 6 *s.* 1 *d.* allowing 5 *per cent.* for the forbearance of Payment? *Anſw.* 4 *years.*

2. In what time will a penſion of 50 *l.* *per ann.* amount to 270 *l.* 16 *s.* 4 *d.* at 4 *per cent.*? *Anſw.* 5 *years.*

3. In what time will the yearly rent of an houſe, being 40 *l.* *per ann.* amount to 335 *l.* 15 *s.* 1 *d* at 6 *per cent.* for non-payment? *Anſw.* 7 *years.*

4. In what time will a ſalary of 35 *l.* *per ann.* amount to 241 *l.* 1 *s.* 7 *d.* 2.6 *qrs*, at 5½ *per cent.* for the forbearance of payment? *Anſw.* 6 *years.*

Note, In this and the two next Sections might be placed Caſe 4; but becauſe it requires an Algebraic method of proceeding in order to find R, I omit inſerting it in this place; this being deſigned to treat only of Numbers.

Of the PRESENT WORTH *of* ANNUITIES, PENSIONS, *&c.*

Note, P, is the preſent Worth U, T, and R, as in the laſt.

CASE 1.

Q. *When* U, T, *and* R, *are given to find* P; *how is it diſcovered?*

A. Thus:

$$\frac{u-\frac{u}{r^{t}}}{r-1}=p$$

EXAM-

EXAMPLES.

1. What is the yearly rent of 20*l.* to continue 6 years, worth in ready Money, at 5 *per cent.*? *Anſw.* 101 *l.* 10*s.* 3*d.* 3*qrs.*

2. What is the preſent worth of a Penſion of 30*l.* *per Ann.* for 5 years, at 4 *per Cent.*? *Anſw.* 133 *l.* 11 *s.* 1 *d.*

3. What muſt be the diſcount of a Leaſe of 50 *l.* *per Ann.* when preſent payment is made for 4 years, at 3 *per Cent.*? *Anſw.* 14 *l.* 2 *s.* 10*d.* 2 *qrs.*

4. An Houſe is let upon Leaſe for 4 years at 70 *l.* *per ann.* and the Leſſee is deſirous to make preſent payment, provided the Leſſor will allow him 5½ *per cent.* I demand how much muſt be paid down, and how much diſcounted?

Anſw. { 243 *l.* 19*s.* 0*d.* 3*qrs.* to be paid down.
36 *l.* 0*s.* 11 *d.* 1 *qr.* to be diſcounted.

CASE 2.

Q. *When* P, T, *and* R, *are given to find* U; *how is it diſcovered?*

A. Thus: $\dfrac{pr^{t} + r - pr^{t}}{r^{t} - 1} = u.$

EXAMPLES.

1. What annuity or yearly rent to continue 6 years, may be purchaſed for 101 *l.* 10*s.* 3*d.* 3*qrs.* at 5 *per cent.* *Anſw.* 20*l.*

2. Suppoſe the preſent payment of 133 *l.* 11 *s.* 1 *d.* were required for a Penſion for 5 years to come, at 4 *per cent.* what is that Penſion? *Anſw.* 30 *l.* *per ann.*

3. If the preſent payment of 185 *l.* 17*s.* 1 *d.* 2 *qrs.* be made for the Leaſe of an Houſe, 4 years to come, at 3 *per cent.* what is the yearly rent? *Anſw.* 50*l.* *per ann.*

4. If an Houſe is let on Leaſe for 4 years, and the Leſſee makes preſent payment of 243 *l.* 19*s.* 0*d.* 3*qrs.* for that time at 5¾ *per cent.* what is the yearly rent of that Houſe? *Anſw.* 70*l.* *per ann.*

CASE 3.

Q. *When* U, P, *and* R, *are given to find* T, *how is it diſcovered?*

A. Thus: $\dfrac{u}{p + u - pr} = r^{t}$ { which being continually divided, by *r*, till nothing remains, the Number of thoſe Diviſions will be = *t*.

EXAMPLES.

1. How long may a leaſe of 20*l.* yearly rent be had for 101 *l.* 10*s.* 3*d.* 3*qrs.* allowing 5 *per cent.* to the purchaſer? *Anſw.* 6 *years.*

2. If

2. I demand what time a leaſe of 30*l.* *per ann.* may be purchaſed for; when preſent payment of 133*l.* 11*s.* 1*d.* is made at 4 *per cent.*? *Anſw.* 5 *years.*

3. If 185*l.* 17*s.* 1*d.* 2*qrs.* be paid down for a leaſe of 50*l.* *per ann.* at 3 *per Cent.* how long is the Leaſe purchaſed for? *Anſw.* 4 *years.*

4. An houſe is let upon leaſe for 70*l.* *per ann.* and the Leſſee makes preſent payment of 243*l.* 19*s.* 0*d.* 3*qrs.* he being allowed $5\frac{3}{4}$ *per cent.* I demand how long the leaſe is purchaſed for? *Anſw.* 4 *years.*

Of ANNUITIES, LEASES, *&c. taken in* REVERSION.

CASE. 1.

Q. *How many Operations are there in Caſe* 1?

A. Two.

Q. *What is the Firſt?*

A. Find the preſent Worth of the yearly Sum at the given Rate, and for the given Time of its continuance; to do which, there are given *U*, *T*, and *R*, to find *P*.

Q. *How is* P *diſcovered?*

A. Thus: $$\frac{u-\frac{u}{r^{t}}}{r-1}=p.$$

Q. *What is the Second?*

A. Find what Principal being put to Intereſt will amount to *P*, at the ſame Rate, and for the Time to come before the Annuity commences, and that will be the preſent Worth of the Annuity, *&c.* in Reverſion; therefore let *P* be changed into *A*=the Amount, and then there will be given *A*, *R*, and *T*, to find *P*, or the Principal.

Q. *How is* P *diſcovered?*

A. Thus: $$\frac{a}{r^{t}}=p.$$

EXAMPLES.

1 What is the preſent worth of the reverſion of a leaſe of 20*l.* *per ann.* to continue 4 years, but not to commence till the end of two years, allowing 5 *per cent.* to the purchaſer? Anſw. 64*l.* 6*s.* 6*d.* 1.4+*qrs.*

2. There is a Leaſe of certain Lands worth 32 *l. per ann.* which is yet in being for 4 years; and the Leſſee is deſirous to take a Leaſe in Reverſion for 7 years, to begin when the old Leaſe ſhall be expired; I demand the preſent worth of the ſaid Leaſe in Reverſion, allowing 5 *per cent.* to the Purchaſer? Anſw. 152 *l.* 6 *s.* 8 *d.* 2 *qrs.* +

3. There is a Houſe now building, which I have a mind to take a Leaſe of for 8 years; but the Houſe will not be finiſhed within 2 years; I demand how much I muſt pay down, when the yearly rent is 100 *l.* and the Landlord allows me 4 *per cent.* on preſent payment? Anſw. 622 *l.* 9 *s.* 7.2 *d.*

CASE 2.

Q. *How many Operations are there in Caſe* 2?

A. Two.

Q. *What is the Firſt?*

A. Find the Amount of the preſent worth of the yearly ſum at the given Rate, and for the time before the Annuity commences, to do which there are given *P*, *R*, and *T*, to find *A*.

Q. *How is* A *diſcovered?*

A. Thus; $pr^t = a$

Q. *What is the Second?*

A. Find what yearly rent being ſold will produce *A* for the preſent Worth, at the ſame rate, and for the time of its continuance; and that will be the yearly Sum required: Therefore let *A* be changed into *P*, and then there will be given *P*, *R*, and *T*, to find *U*, or the yearly Sum.

Q. *How is* U *diſcovered?*

A. Thus: $\frac{\overline{pr^t \times r - pr^t}}{r^t - 1} = u$

EXAMPLES.

1. What annuity or yearly rent to be entered upon 2 years hence, and then to continue 4 years, may be purchaſed for 64 *l.* 6 *s.* 6 *d.* 2 *qrs.* ready Money, at 5 *per cent.*? Anſw. 20 *l.*

2. There is a Leaſe of certain Lands, in being for 4 years, and the Leſſee being minded to take a Leaſe in Reverſion for 7 years, to begin when the old Leaſe ſhall be expired, laid down 152 *l.* 6 *s.* 8 *d.* 2 *qrs.* I demand the yearly rent of the ſaid Lands, when allowance was made to the Leſſee at 5 *per cent.*? Anſw. 32 *l*, *per ann.*

3. The preſent payment for the leaſe of an Houſe is 622 *l.* 9 *s.* 7.2 *d.* Now I have taken a leaſe in reverſion for 8 years, which is to commence at the end of two years; I demand how much the yearly rent is, when for the ſaid preſent payment I was allowed 4 *l. per cent.*? Anſw. 100 *l. per ann.*

CASE 3.

Q. *How many Operations are there in Caſe* 3?

A. Two.

Q. *What is the Firſt*?

A. Find the amount of the preſent worth of the yearly ſum at the given rate, and for the time before the annuity, *&c.* commences; to do which there are given *P*, *R*, and *T*, to find *A*, as in Caſe 2.

Q. *How is* A *diſcovered*?

A. Thus: $pr^{t} = a$

Q. *What is the ſecond Operation*?

A. Find what time the yearly rent given, being ſold for will produce *A* for the preſent worth, at the ſame rate, and that will be the time required: Therefore change *A*, into *P*, and then there will be given *U*, *P*, and *R*, to find *T*, as in Caſe 3, page 160.

Q. *How is* T *diſcovered*?

A. Thus: $\frac{u}{p+u-pr} = r^{t}$ which being continually divided by *r*, till nothing remains, the number of thoſe Diviſions will be $= t$.

EXAMPLES.

1. The preſent worth of a certain leaſe in reverſion is 64 *l.* 6 *s.* 6 *d.* 2 *qrs.* the leaſe is 20 *l. per ann.* and commences two years hence, and the allowance to the purchaſer is 5 *per cent.* I demand the time of its continuance? Anſw. 4 *years.*

2. A certain Man took a leaſe of ſome lands for a time, which by agreement was not to commence till the expiration of 4 years; the yearly rent was 32 *l.* it was alſo agreed, that the purchaſer ſhould lay down 152 *l.* 6 *s.* 8 *d.* 2 *qrs.* and be allowed for his preſent pay 5 *per cent.* I demand the time that the leaſe was taken for? Anſw 7 *years.*

3. The preſent payment for the leaſe of an houſe is 622 *l.* 9 *s.* 7.2 *d.* and the yearly rent is 100 *l.* Now I have taken a leaſe in reverſion, which is to commence at the end of 2 years; I demand the length of the leaſe, when I was allowed 4 *per cent.* for my money? Anſw. 8 *years.*

Of purchaſing REAL *or* FREEHOLD ESTATES.

Q. *What do you underſtand by a Real or Freehold Eſtate?*
A. Such as is bought to continue for ever.

Note, U, repreſents the yearly Rent; R the Amount of 1 l. &c. and P, the preſent Worth.

CASE 1.

Q. *When* U, *and* R, *are given to find* P; *how is it diſcovered?*

A. Thus: $\frac{u}{r-1}=p.$

EXAMPLES.

1. Supooſe a freehold eſtate of 40*l. per ann.* is to be ſold; what is it worth, allowing the buyer 5 *per cent.* for his money? Anſw. 800 *l.*

2. What is an eſtate of 290*l. per ann.* to continue for ever, worth in preſent money, allowing 4 *per cent.* to the buyer? Anſw. 7250 *l.*

CASE 2.

Q. *When* P, *and* R, *are given to find* U; *how is it diſcovered?*

A. Thus: $p\times\overline{r-1}=u.$

EXAMPLES.

1. If a freehold eſtate is bought for 800 *l.* and the allowance of 5 *per cent.* is made to the buyer; I demand the yearly rent? Anſw. 40*l. per ann.*

2. If an eſtate be ſold for 7250 *l.* preſent money, and 4 *per cent.* is allowed to the buyer for the ſame; I demand the yearly rent? Anſw. 290 *l per ann.*

CASE 3.

Q. *When* P, *and* U, *are given to find* R; *how is it diſcovered?*

A. Thus: $\frac{p+u}{p}=r$

EXAMPLES.

1. If a real eſtate of 40 *l. per ann.* be ſold for 800 *l.* I demand the rate *per cent.?* Anſw. 5 *per cent.*

2. If a freehold eſtate of 290 *l. per ann.* be bought for 7250 *l.* I demand the rate *per cent.* allowed? Anſw. 4 *per cent.*

Of purchaſing FREEHOLD ESTATES *in* REVERSION.

CASE 1.

Q. *How many Operations are there in Caſe* 1?

A. Two.

Q. *What is the firſt*?

A. Find the preſent worth of the yearly Sum at the given Rate, to do which there are given *U*, and *R*, to find *P*.

Q. *How is* P *diſcovered*?

A. Thus; $\frac{u}{r-1}=p$.

Q. *What is the ſecond Operation*?

A. Find what Principal being put to Intereſt will amount to *P*, at the ſame Rate, and for the time to come before the Eſtate commences, and that will be the preſent Worth of the Eſtate in Reverſion. Therefore let *P* be changed into *A*=the Amount, and then there will be given *A*, *R*, and *T*, to find *P*=the Principal.

Q. *How is* P *diſcovered*?

A. Thus; $\frac{a}{r^{t}}=p$.

EXAMPLES.

1. Suppoſe a freehold eſtate of 40 *l. per ann.* to commence 3 Years hence, is to be ſold, what is it worth, allowing the Purchaſer 5 *per cent.* for his preſent Payment? Anſw. 691 *l.* 1 *s.* 4 *d.* 3 *qrs.*+

2 What is an eſtate of 290 *l. per ann.* to continue for ever, but not to commence till the expiration of 4 years, worth in preſent Money, allowance being made at 4 *per cent.*? Anſw. 6197 *l.* 6 *s.* 5 *d.* 2 *qrs.*+

CASE 2.

Q. *How many Operations are there in Caſe* 2?

A. Two.

Q. *What is the firſt*?

A. Find the Amount of the preſent worth of the yearly Rent at the given Rate, and for the time before the eſtate commences; to do which there are given *P*, *T*, and *R*, to find *A*.

Q. *How is* A *diſcovered?*

A. Thus; $prt = a$.

Q. *What is the ſecond Operation?*

A. Find what yearly rent being ſold will produce *A* for the preſent worth, at the ſame Rate, and that will be the yearly ſum required: Therefore let *A* be changed into *P*, and then there will be given *P*, and *R*, to find *U*, or the yearly Sum.

Q. *How is* U *diſcovered?*

A. Thus; $\frac{\overline{pr \times r - pr}}{r} = u$

EXAMPLES.

1. Suppoſe a freehold eſtate, to commence 3 years hence, is ſold for 691 *l.* 1 *s.* 5 *d.* allowing to the purchaſer 5 *per cent.* I demand the yearly income? Anſw. 40 *l. per ann.*

2. There is a certain freehold eſtate bought for 6197 *l.* 6 *s.* 5 *d.* 2 *qrs.* which does not commence till the expiration of 4 years the buyer was allowed 4 *per cent.* for his Money; I demand the yearly income? Anſw. 290 *l. per ann.*

Of REBATE *or* DISCOUNT.

Q. *What particular Letters are uſed here?*

A. Theſe.

S, the Sum to be diſcounted for;

P, the preſent worth of the Sum, due at any time to come;

T, the time before it becomes due; and,

R, the Amount of 1 *l.* for one Year, at any Rate *per cent.*

CASE 1.

Q. *When* S, T, *and* R, *are given to find* P; *how is it diſcovered?*

A. Thus; $\frac{s}{\overset{t}{r}} = p$.

EXAMPLES.

1. What is the preſent worth of 520 *l.* 18 *s.* 7 *d.* 2 *qrs.* payable 3 years hence, at 5 *per cent.*? Anſw. 450 *l.*

2. There is a Debt of 504 *l.* 19 *s.* 9 *d.* 3 *qrs.* which is not due until 4 years hence, but it is agreed to be paid in preſent Money; what ſum muſt the Creditor receive, allowing the Rebate of 6 *per cent.* to the Debtor for his Money? Anſw. 400 *l.*

3. If 643 *l.* 4 *s.* 11 *d.* be payable in 6 Years time; what is the preſent worth, Rebate being made at 5 *per cent.*? Anſw. 480 *l.*

CASE 2.

Q. *When* P, T, *and* R, *are given to find* S; *how is it diſcovered*?

A. Thus; $p \times r^{t} = s$.

EXAMPLES.

1. If 450 *l.* be received for a Debt, payable 3 Years hence, and an allowance of 5 *per cent.* was made to the Debtor for his preſent Payment; I demand what the Debt was? Anſw. 520 *l.* 18 *s.* 7 *d.* 2 *qrs.*

2. There is a ſum of Money, due at the expiration of 4 years, but the Creditor agrees to take 400*l.* down, allowing 6 *per cent.* on preſent payment; I demand what the Debt was? Anſw. 504 *l.* 19 *s.* 9 *d.* 3 *qrs.*

3. If a ſum of Money, due 6 Years hence, produces 480 *l.* for preſent Payment, Rebate being made at 5 *per cent.* I demand how much the Debt was? Anſw. 643 *l.* 4 *s.* 11 *d.*

CASE 3.

Q. *When* S, P, *and* R, *are given to find* T; *how is it diſcovered*?

A. Thus; $\frac{s}{p} = r^{t}$ $\Big\{$ which being continually divided by *r* till nothing remains, the Number of thoſe Diviſions will be $=t$.

EXAMPLES.

1. A certain Man received 450 *l.* down for a Debt of 520 *l.* 18 *s.* 7 *s.* 2 *qrs.* Rebate being made at 5 *per cent.* I demand in what time the Debt was payable? Anſw. 3 years.

2. There is a Debt of 504 *l.* 19 *s.* 9 *d.* 3 *qrs.* payable at a certain time; but it is agreed to pay 400 *l.* down at the allowance of 6 *per cent.* to the Debtor for his preſent Money; I demand in what time the Debt would become due, if no ſuch payment was to be made? Anſw. 4 years.

3. The preſent payment of 480 *l.* is made for a Debt of 643 *l.* 4 *s.* 11 *d.* Rebate at 5 *per cent.* I demand when the Debt was payable? Anſw. 6 years.

CASE 4.

Q. *When* S, P, *and* T, *are given to find* R; *how is it diſcovered?*

A. Thus; $\frac{s}{p}\,{}^{t} = r$ which muſt be extracted by the Rules of Extraction; the time given in the Queſtion $= t$, ſhewing the Power.

EXAMPLES.

1. The preſent worth of 520 *l.* 18 *s.* 7 *d.* 2 *qrs.* payable 3 years hence is 450 *l.* I demand at what Rate *per cent.* Rebate is made? Anſw. 5 *per cent.*

2. A Debt of 504 *l.* 19 *s.* 9 *d.* 3 *qrs.* will be due 4 years hence; but it is agreed to take 400 *l.* down; what is the Rate *per cent.* that the Rebate is made at? Anſw. 6 *per cent.*

3. The ſum of 643 *l.* 4 *s.* 11 *d.* is payable in 6 years time; and the preſent worth of that Sum is 480 *l.* I demand at what Rate *per cent.* muſt Rebate be made, to produce the ſaid preſent worth? Anſw. 5 *per cent.*

Note 1. Equation of Payments at Compound Intereſt ſhould follow next, but as that Rule is beſt done by the Logarithms, the kind Reader will, I hope, take this as a ſufficient Reaſon for not placing it here.

2. The whole buſineſs of Compound Intereſt is better performed by the Logarithms, or by Tables calculated for that purpoſe, than otherwiſe: eſpecially when the Time given is very long, as for 20, 30, or 40 Years, and when the Payments are to be made half-yearly or quarterly. What is here done ſerves only for whole Years, and ſhews what can be done by the Pen, where the Logarithms or Tables are wanting.

A PRACTICAL *and* EASY METHOD *to caſt up the* VALUE *of* TIMBER.

Rule. Multiply the Number of Feet by the Price in (Shillings) per load, and cut off 3 Places to the right Hand, which make Pounds and Decimals Parts thereof.

EXAMPLES.

754 Feet at 1*l.* 7*s.* 6*d.* per Load
754 754 at 6*d.* = 377
27
20358
+377 *l.* *s.* *d.*
20.375 = 20 14 $9\frac{1}{4}$

856 Feet at 1*l.* 6*s.* per load.
Facit 22 *l.* 5 *s.* 1 *d.* $\frac{1}{4}$
730 Feet at 1*l.* 8*s.* 6*d.* per load.
Facit 20 *l.* 16 *s.* 1 *d.*
433 Feet at 1*l.* 3*s* 6*d.* per load.
Facit 10 *l.* 3 *s.* 6 *d.*

Demonſtration. 50 Feet make a Load; therefore it is, As 50 Feet . . Price in Shillings : : Feet given . . Value in Shillings, which $\div$ 20 are Pounds: But as $50 \times 20 = 1000$ which is a Diviſor for Pounds; therefore the firſt Figure being 1, and the reſt Cyphers, Diviſion is made at once by pointing off three Places as above.

THE

THE

Schoolmaſters Aſſiſtant.

PART IV.

A Collection of QUESTIONS *to exerciſe the foregoing* RULES.

1. WRITE down nine hundred millions, ſeven hundred ſixty thouſand and twenty-one.

2. What muſt 20*s.* pay towards a tax, when 326 *l.* 6 *s.* 8 *d.* is aſſeſſed at 41 *l.* 16 *s.* 2 *d.*? *Anſw.* 2 *s.* 6 *d.* 2 *qrs.* $\frac{77609}{78320}$.

3. If the $\frac{1}{3}$ of 6 be 3; what will the $\frac{1}{4}$ of 20 be? *Anſw.* 7½.

4. I demand the ſum of 1748 added to itſelf? *Anſw.* 3496.

5. I demand the Product of 76 multiplied by itſelf? *Anſw.* 5776.

6. I demand the Difference between 14676 and the fourth of itſelf? *Anſw.* 11007.

7. I demand the Quotient of the Square of 476 divided by the half of its Root? *Anſw.* 952.

8. There is, in 3 Bags, the ſum of 1468 *l.* *viz.* in the firſt Bag 461 *l.* in the ſecond 581 *l.* I demand what is in the third Bag? *Anſw.* 426 *l.*

9. What Number is that which being multiplied by 13, the Product will be 221? *Anſw.* 17.

10. Two Perſons, *A* and *B*, owe ſeveral Debts; the leſſer Debt, being that of *A*, is 2173 *l.* the difference is 371 *l.* what is the Debt of *B*? *Anſw.* 2544 *l.*

11. A Captain and 160 Sailors took a Prize, worth 1360 *l.* of which the Captain had $\frac{1}{5}$ for his Share, and the reſt was equally divided among the Sailors; what was each Man's part? *Anſw. The Captain had* 272 *l. and each Sailor had* 6 *l.* 16 *s.*

12. An ancient Lady being demanded how old ſhe was; to avoid a direct anſwer, ſaid, I have 9 Children, and there are 3 Years between the Birth of each of them; the eldeſt was born when I was 19 Years old, which is now exactly the age of the youngeſt; how old was the Lady? *Anſw.* 62 *yrs. old.*

13. What Number is that from which if you take 341, the Remainder will be 726? Anſw. 1067.

14. What Number is that which being added to 168, makes the Sum to be 706? Anſw. 538.

15. What Number is that which being divided by 19, the Quotient will be 72? Anſw. 1368.

16. A Broker bought for his Principal, in the year 1720, 400 *l.* Capital Stock in the South-Sea, at 650 *per cent.* and ſold it again when it was worth but 130 *per cent.* how much was loſt in the whole? Anſw. 2080 *l.*

17. The ſum of two Numbers is 4139, their difference is 948; what is the leſſer Number? Anſw. 1595.5.

18. A Gentleman went to Sea at 17 years of age, 8 years after that he had a Son born, who lived 46 years, and died before his Father; after whom the Father lived twice 20 years, and then died alſo; I demand the age of the Father when he died? Anſw. 111 *years.*

19. Three Gardeners, *A*, *B*, and *C*, having bought a piece of Ground, find the Profits of it amount to 120 *l.* *per annum*, now the ſum of Money which they laid down was in ſuch Proportion, that as often as *A* paid 5 *l.* *B* paid 7 *l.* and as often as *B* paid 4 *l.* *C* paid 6 *l.* I demand how much each Man muſt have *per annum* of the gain?

B *A* *B* *A*
$7 : 5 :: 4 : 2\frac{6}{7}$
A *C* *A* *C*
$2\frac{6}{7} : 6 :: 5 : 10\frac{1}{2}$

		l.	*s.*	*d.*
Anſw.	*A*	26	13	4
	B	37	6	8
	C	56	0	0
		120	0	0

20. *A*, *B*, and *C*, freight a Ship with Wine, *viz.* *A* lays out 1342 *l.* *B* 1178 *l.* *C* 630 *l.* the whole 212 Tuns are ſold at 32 *l.* *per* Tun; what ſhall each Man receive?

		l.	*s.*	*d.*	*qrs.*
Anſw.	*A*	2890	3	11	$3\frac{1200}{3150}$
	B	2537	$\frac{2}{3150}$		
	C	1356	16	0	

21. *A*, *B*, and *C*, made up a Stock of 1000 *l.* whereof *A* put in 409 *l.* *B* 198 *l.* and they improved it to 1964 *l.* I demand what was the Stock of *C*, and what was each Man's ſhare of the whole gain?

		l.	*s.*	*d.*
Anſw.	*C's Stock was*	393	0	0
	A's Share was	803	5	$6\frac{240}{1200}$
	B's — — —	388	17	$5\frac{280}{1000}$
	C's — — —	771	17	$0\frac{480}{1000}$

22. *A*, *B*, and *C*, freight a ſhip for the Canaries worth 3696 *l.* whereof *A* put in 369 *l.* *B* 897 *l.* but by reaſon of a ſtorm one third of the Goods were caſt overboard; I demand each Man's ſhare of the loſs? *Anſw.* A'*s Loſs was* 123 *l.* B'*s* 299 *l. and* C'*s* 810 *l.*

23. *A* and *B* traded together, and gained 100 *l.* *A* put in 640 *l.* *B* put in ſo much that he muſt receive 60 *l.* of the gain; I demand how much *B* put in? *Anſw.* 960 *l.*

24. What is the Value of 27 Dozen, 10 *lb.* of Candles, at 5 *d. per lb.*? *Anſw.* 6 *l.* 19 *s.* 2 *d.*

25. Bought 28 *qrs.* 2 *buſh.* of Wheat, at 4 *s.* 6 *d per* Buſhel; what is the worth of it? *Anſw.* 50 *l.* 17 *s.*

26. If a Man earn 2 *s.* 6 *d.* 2 *qrs. per* Day, how much is that for 19 Weeks, Sundays excepted? *Anſw.* 14 *l.* 9 *s.* 9 *d.*

27. *A*, *B*, and *C*, traded together, the firſt laid in I know not how much; *B* put in 20 Pieces of Cloth; and *C* put in 500 *l.* and they have gained 1000 *l.* whereof *A* ought to have 350 *l.* and *B* 400 *l.* I demand *C*'s ſhare, how much the firſt Man laid in, and what the 20 Pieces of Cloth were worth? *Anſw.* C'*s Share was* 250 *l.* A *laid in* 700 *l. and* B'*s Cloth was worth* 800 *l.*

28. A Merchant buys up ſix Bags of Canterbury Hops, N° 1. of which weighed *C.wt.* 3 3 20, N° 2. *C. wt.* 3 2 26, N° 3. *C. wt.* 3 0 24, N° 4. *C. wt.* 3 3 only, N° 5. *C. wt.* 2 2 22, N° 6. *C. wt.* 2 2 26, beſides 5 Pockets, 3 of which weighed 76 *lb.* $\frac{3}{4}$ each, and the other two 62 *lb.* $\frac{1}{4}$ each; how many *C. wt.* has he to pay Carriage for? *Anſw. C. wt.* 23 0 24$\frac{3}{4}$.

29. How many Ducats muſt I deliver at Venice to receive at London 178 *l.* 2 *s.* the Exchange being at 4 *s.* 4 *d. per* Ducat? *Anſw.* 822 *Ducats.*

30. A Traveller would change 500 French Crowns, at 4 *s.* 6 *d. per* Crown, into Sterling Money, but he muſt pay a halfpenny *per* Crown for Change; how much muſt he receive? *Anſw.* 111 *l.* 9 *s.* 2 *d.*

31. When a Factor taketh 1 *l. per cent.* for his Commiſſion, what muſt he have for 743 *l.* 17 *s.* 3 *d.*? *Anſw.* 7 *l.* 8 *s.* 9 *d.* 1 *qr.* $\frac{192}{2400}$.

32. Two Merchants in Company gained 100 *l.* *A* laid in ſo much, that for his ſhare of the Gain he muſt have 60 *l.* *B* laid in 720 Ducats, at 6 *s.* 8 *d. per* Ducat; I demand how much *A* laid in, and what the Ducats were worth? *Anſw.* A *laid in* 360 *l. and the Ducats were worth* 240 *l.*

33. There were two Merchants, who traded in Company; the firſt laid in the Sum of 640 *l.* and took $\frac{5}{8}$ of the Gain; I demand how much the ſecond Merchant laid in? Anſw. 384 *l.*

34. What Number is that which being multiplied by 15, the Product will be $\frac{3}{4}$? Anſw. $\frac{1}{20}$.

35. I demand the $\frac{5}{8}$ of 20 Shillings? Anſw. 12 *s.* 6 *d*

36. What Fraction is that, to which if you add $\frac{2}{5}$, the ſum will be $\frac{5}{6}$? Anſw. $\frac{13}{30}$.

37. What Number is that, to which if you add $7\frac{2}{3}$, the whole will be $12\frac{1}{4}$? Anſw. $4\frac{7}{12}$.

38. What Number is that, from which if you take $\frac{3}{5}$ the Remainder will be $\frac{1}{8}$? Anſw. $\frac{29}{40}$.

39. What Number is that, from which if you take $13\frac{1}{2}$ the Remainder will be $5\frac{5}{7}$? Anſw. $19\frac{3}{14}$.

40. What Number is that, which being divided by $\frac{3}{4}$ the Quotient will be 21? Anſw. $15\frac{3}{4}$.

41. What Number is that, which being multiplied by $\frac{2}{3}$ produceth $\frac{1}{4}$? Anſw. $\frac{3}{8}$.

42. What Number is that, from which if you take $\frac{2}{5}$ of itſelf, the Remainder will be 12? Anſw. 20.

43. What part of 25 is $\frac{5}{8}$ of an Unit? Anſw. $\frac{1}{40}$.

44. What Number is that, to which if you add its own $\frac{2}{3}$, the whole ſhall be 20? Anſw. 12.

45. What Number is that, which maketh 9 to be the $\frac{2}{3}$ of it? Anſw. $13\frac{1}{2}$.

46. If a Cannon may be diſcharged at twice with 6 *lb.* of Powder; how many times will 7 *C.* 3 *qrs.* 17 *lb.* diſcharge the ſame Piece? Anſw. 295 *times.*

47. If $\frac{3}{8}$ of a Ship be worth 3740 *l.* what is the whole worth? Anſw. 9973 *l.* 6 *s.* 8 *d.*

48. A young Man received 210 *l.* which was $\frac{2}{3}$ of his elder Brother's Portion; now three times the elder Brother's Portion was half of the Father's eſtate; I demand how much the eſtate was? Anſw. 1890 *l.*

49. A Factor bought a certain Quantity of Broad Cloth, and Drugget, which together coſt him 81 *l.* The Quantity of broad Cloth that he bought was 50 *yds.* at 18 *s. per yd.* and for every five *yds.* of broad Cloth, he had nine *yds.* of Drugget; I demand how many *yds.* of Drugget he had, and how much the Drugget coſt him *per* Yard? Anſw. 90 *Yards of Drugget, at* 8 *s. per Yard.*

50. A certain Uſurer lent out 90 *l.* for 12 Months, and received principal and intereſt 95 *l.* 8 *s.* I demand at what rate *per cent.* he received intereſt? *Anſw.* 6 *l. per cent.*

51. Two Men depart both from one place, the one goes North and the other South, the one goes 7 miles a-day, and the other 11 miles a-day; how far are they diſtant the 12th day after their departure? *Anſw.* 216 *miles.*

52. A Merchant bought 8 tuns of Wine, which having received damage, he ſold for 400 *l.* and 12 *l. per cent.* loſs; I demand how much it coſt him *per* Tun, and how he ſold it *per* Gallon, to loſe after the ſaid rate?

Anſw. { *Coſt*—56 *l.* 0 *s.* 0 *d. per Tun.*
{ *Sold at* 0 *l.* 3 *s.* 11 *d.* 2 *qrs.* $\frac{960}{2010}$ *per Gallon.*

53. Two Men depart both from one place, and both go the ſame road; the one travels 12 miles every day, the other 17 miles every day; how far are they diſtant the tenth day after their departure? *Anſw.* 50 *miles.*

54. If a Gentleman hath an eſtate of 1000 *l. per ann.* how much may he ſpend one day with another, to lay up threeſcore Guineas at the Year's end? *Anſw.* 2 *l.* 11 *s.* 4 *d.* $\frac{40}{365}$.

55. If 76 *lb.* of Cinnamon coſt 40 *l.* 10 *s.* 8 *d.* and 1 *C.wt.* of Nutmegs 59 *l.* 14 *s.* 8 *d.* I demand the price of 3 *oz.* one with another? *Anſw.* 2 *s.*

56. A Grocer delivered 17 *C.* 3 *qrs.* 10 *lb.* of Tobacco in the roll to be cut and dried, and when it came home, it held out 16 *C.* 0 *qrs.* 14 *lb.* I demand how much was loſt in every *lb.*? and alſo ſuppoſing it coſt in the roll 8 *d.* $\frac{6}{7}$ *per lb.* and the cutting 1 *d.* $\frac{5}{8}$ *per lb.* I demand what it now ſtands him in?

Anſw. { *Loſt per lb.* 1 *oz.* 8 *dr.* $\frac{1200}{1998}$.
{ *It ſtands him in* 87 *l.* 5 *s.* 3 *d.* 1 *qr.* $\frac{16}{56}$.

57. If Tallow be ſold for 4 *d. per lb.* what is the value of 3 tubs, each 3 *C.* 1 *qr.* 10 *lb.* groſs, tare *per* tub 25 *lb.*? *Anſw.* 17 *l.* 9 *s.*

58. Shipp'd from Spain 10 tuns of Wine, at 10 *l.* Sterling *per hhd.* paid cuſtom at the port of London 1 *s. per* gallon: The charges for lighterage, Cartage, and porterage, amounted to 5 *l.* afterwards by the misfortune of a pipe ſtaving, containing 126 gallons, I loſt 59 gallons; the next day 28 gallons more run out, and the remainder of the pipe not being ſaleable, I threw it away. The market price not running high, I ſold the reſt for 17 *l. per hhd.* I demand how much I gained or loſt by the ſale of the ſaid Wine? *Anſw. gain'd* 115 *l.*

59. A Ship's Company took a prize of 300 *l.* which is to be divided among them as parties, according only to their pay, and the time they have been on board; the Officers and Midſhipmen 5 months, and the Sailors 3 months. The Officers, one with another, had 40 *s. per* month: The Midſhipmen 30 *s. per* month, and the Sailors 22 *s.* There were 6 Officers, 12 Midſhipmen, and 84 Sailors; what muſt each party have of the prize, and what each ſingle perſon?

Anſw.	*l.*	*s.*	*d.*	*qrs.*	each Man	*l.*	*s.*	*d.*	*qrs.*
The Officers, -	144	4	7	$1\frac{224}{416}$		24	0	9	0+
Midſhipmen, -	108	3	5	$2\frac{64}{416}$		9	0	3	1+
Sailors - -	57	11	11	$0\frac{128}{416}$		0	11	3	3+

60. If 1000 *lb.* of Beef ſerve 240 Men 8 days, how many *lb.* will ſerve 460 Men 10 weeks? *Anſw.* 16770 *lb.* 13 *oz.* $\frac{640}{1920}$.

61. What is the amount of 1000 *l.* for 5 years and an half, at $4\frac{3}{4}$ *per cent.* ſimple intereſt? *Anſw.* 1261 *l.* 5 *s.*

62. Sold Goods amounting to the value of 700 *l.* for two 4 months; what is the preſent worth at 5 *per cent.* ſimple intereſt? *Anſw.* 682 *l.* 19 *s.* 5 *d.* 2 *qrs.*

63. A Merchant bought 400 Cloths, at 12 *l. per* Cloth, which he ſhipped for Spain, to have returns from thence, the one-half in Wine at 30 *l. per* Tun, and the other half in Rice, at 28 *s. per C.wt.* I demand how much of each muſt be returned for the Cloths? *Anſw.* 80 *Tons of Wine; and* 1714 *C.* 1 *qr.* 4 *lb. of Rice.*

64. A Tobacconiſt hath ſeveral ſorts of Tobacco; *viz.* of 12 *d. per lb.* of 16 *d. per lb.* of 18 *d. per lb.* and of 2 *s. per lb.* and he is deſirous to make a mixture of an *C.wt.* worth 20 *d. per lb.* I demand how much of each ſort muſt be taken?

Anſw.	*lb.*	*oz.*		*d. per lb.*
	17	$3\frac{18}{26}$	*at*	12
	17	$3\frac{18}{26}$	*at*	16
	17	$3\frac{18}{26}$	*at*	18
	60	$4\frac{24}{26}$	*at*	24

65. A Brewer mixed 17 gallons of Ale, at 8 *d. per* gallon, with 19 gallons at 10 *d. per* gallon, and with 40 gallons at 6 *d. per* gallon, I demand what 1 gallon of this mixture is worth, and alſo the worth of the whole quantity?

Anſw. 0 *l.* 0 *s.* 7 *d.* 1 *qr.* $\frac{60}{76}$ *per Gallon.*
2 *l.* 7 *s.* 2 *d. the price of the whole mixture.*

66. There are two Numbers, the one 48, the other twice as much; I demand the difference between their ſum and difference? *Anſw.* 96.

67. There are two Numbers, the one 63, the other half as much; I demand the product of their ſquares, and the difference of their product and ſum?

Anſw. { *Product of the Squares* 3938240.25
Difference — 1890.

68. There are two Numbers, the one 25, the other the ſquare of 25; I demand the ſquare-root of the ſum of their ſquares? *Anſw.* 625.4998+

69. There are two Numbers, whoſe product is 1058, and multiplicand 46; I demand the multiplier; the ſum of their factors, and the difference between the ſum of the Cubes of the factors, and the ſquare of the product?

Anſw. { *Multiplier* — 23.
Sum of the factors 69.
Difference 1009861.

70. There are two Numbers whoſe dividend is 1216, and the quotient 76; I demand the diviſor; the difference between the cube of the quotient, and the ſum of the ſquares of the diviſor and dividend; and the cube-root of the ſum of the cubes of the diviſor, dividend and quotient?

Anſw. { *Diviſor* — — 16.
Difference 1039936.
Cube-root — 1216.

71. Two Men ſet out at the ſame time from the ſame place, but go contrary ways; and they travel each of them 34 miles a-day: I demand the time in which they will have travelled 2000 miles? *Anſw.* 29 *days*, 9 *hours*, 52 *min.* $\frac{64}{68}$.

72. Six Rogues, *viz.* A, B, C, D, E, and F, having entered into a confederacy, do agree to divide whatever ſums of money they at any time take upon the highways, according to their valour, that is, in proportion to the number of ſcars they ſhould then have on their faces: Now the firſt two, *viz.* A and B, being very bold and daring fellows, had received A 20, and B 19 ſcars: The next two, *viz.* C, and D, having a leſs ſhare of courage, and not caring to ſtand all brunts, had each of them but 9 ſcars; but the other two, *viz.* E, and F, being mere cowards, always turned their backs at the leaſt oppoſition, and ſo by chance they had one a-piece; and they having at ſeveral times, ſtolen the ſum of 700 *l.* 13 *s.* I deſire to know how they muſt divide it?

Anſw.

		l.	*s.*	*d.*	*qrs.*
Anſw.	A *muſt have*	237	10	2	$0\frac{8}{59}$.
	B —	225	12	7	$3\frac{43}{59}$.
	C — —	106	17	6	$3\frac{39}{59}$.
	D ——	106	17	6	$3\frac{39}{59}$.
	E — —	11	17	6	$0\frac{24}{59}$.
	F — — —	11	17	6	$0\frac{24}{59}$.

73. There are three Numbers, 17, 19, and 48; I demand the difference between the ſum of the ſquares of the firſt and laſt, and the cube of the middlemoſt? Anſw. 4266.

74. In ſeven Cheeſes, each weighing 1 *C.* 2 *qrs.* 5 *lb.* how many allowances for ſeamen may be cut, each weighing 5 *oz.* 7 *dr.?* Anſw. 3563 $\frac{35}{87}$ *allowances.*

75. In 81034 rundlets of Brandy, each 18 gallons, how many groſs of bottles, each $\frac{8}{9}$ of a quart? Anſw. 45581 *groſs,* 7 *doz.* 6 *bottles.*

76. In 731 *doz.* bottles of Wine, each $1\frac{5}{7}$ pint, how many hogſheads? Anſw 29 *hhds.* 52 *galls.* 5 *pts.* $\frac{5}{7}$.

77. Sold 8 *C.* $\frac{1}{2}$ of Steel, at 12 *d per lb.* how much Flemiſh money, at 33 *s.* 8 *d. per l.* Sterl. am I to receive for the ſame? Anſw. 80 *l.* 2 *s.* 6 *d.* $\frac{96}{240}$ *Flemiſh.*

78. If 48 taken from 120 leave 72, and 72 taken from 91 leave 19, and 7 taken from thence leave 12; what number is that, out of which, when you have taken 48, 72, 19, and 7, leaves 12? Anſw. 158.

79. *A* hath $\frac{1}{2}$ of a ſhip, *B* $\frac{1}{4}$ *C* $\frac{1}{16}$, *D* $\frac{3}{16}$; the Maſter clears 120 *l.* how much muſt each Owner have?

		l.	*s.*
Anſw.	A *muſt have*	60	0
	B — —	30	0
	C — —	7	10
	D — —	22	10

80. A Gentleman having 50 *s.* to pay among his Labourers for a Day's Work, would give to every Boy 6 *d.* to every Woman 8 *d.* and to every Man 16 *d.* the number of Boys, Women, and Men, was the ſame; I demand the number of each? Anſw. 20 *of each ſort.*

81. A Gentleman had 7 *l.* 17 *s.* 6 *d.* to pay among his Labourers; to every Boy he gave 6 *d.* to every Woman 8 *d.* and to every Man 16 *d.* and there were for every Boy three Women; and for every Woman two Men; I demand the number of each? Anſw. 15 *Boys,* 45 *Women,* 90 *Men.*

82. Admit a tax of 39 *l.* is laid on a town for the building of a bridge, and the value of the town-rent is 900 *l. per ann.* what ſhall a man pay towards it, whoſe income is worth 100*l. per ann.*? *Anſw.* 4 *l.* 6 *s.* 8 *d.*

83. Suppoſe *A* hath an eſtate of 53 *l. per ann.* and pay 5 *s.* 10 *d.* to a ſubſidy; what ſhall *B* pay, whoſe eſtate is worth 100 *l. per ann.*? *Anſw.* 11 *s.* 0 *d.* $\frac{4}{53}$.

84. If 136 *l.* are to be divided between two Men, ſo as the leſſer ſhare may have ſuch proportion to the greater as 2 to 5, what muſt each Man have?

		l.	*s.*	*d.*	*qrs.*
Anſw.	*One muſt have*	38	17	1	2 $\frac{6}{7}$.
	The other	97	2	10	1 $\frac{1}{7}$.

85. There are 1000 *l.* to be divided among three Men, in ſuch manner, that if *A* have 3 *l.* *B* ſhall have 5 *l.* and *C* 8 *l.* how much muſt each Man have?

		l.	*s.*
Anſw.	A *muſt have*	187	10
	B - -	312	10
	C -	500	0

86. Shipp'd for Jamaica 550 pair of Stockings, at 11 *s.* 6 *d. per* pair, and 460 yards of Stuff, at 14 *d. per* yard; in return for which, I had 46 *C.* 3 *qrs.* of Sugar, at 24 *s.* 6 *d. per C.* and 1570 *lb.* of Indigo, at 2 *s.* 4 *d. per lb.* what remains due to me of my adventure? *Anſw.* 102 *l.* 12 *s.* 11 *d.* 2 *qrs.*

87. If one Pound ten, and forty Groats
  Will buy a load of Hay;
How many Pounds with nineteen Crowns
  For twenty Loads will pay? *Anſw.* 38 *l.* 11 *s.* 8 *d.*

88. A Man driving his Geeſe to the Market, was met by another, who ſaid, Good-morrow, maſter, with your hundred Geeſe. Says he, I have not an hundred; but if I had half as many as I now have, and two Geeſe and a half, beſide the number I have already, I ſhould have an hundred: How many had he? *Anſw* 65.

89. If a Tower be 384 feet high from the foundation, and a ſixth part be under the earth, and an eight part under the water; how much in height is viſible? *Anſw.* 272 *feet*

90. A Merchant would lay out in Spices 560 *l.* at the following prices, *viz.* Cloves at 4 *s. per lb* Mace at 7 *s.* Cinnamon at 3 *s.* Nutmegs at 12 *s.* and Pepper at 2 *s. per lb* and he would have an equal Quantity of each ſort; I demand that Quantity? *Anſw.* 400 *lb of each ſort.*

91. The computed diſtance between London and York is 150 miles; now if a Man ſets out from London, and walks every day towards York 20 miles, and back again towards London 15 miles; how long will it be before he gets to his journey's end? *Anſw* 30 *days*

92. Bought 127 pieces of Cloth, for which I delivered 3589 ells of Holland at 7 *s.* 11 *d. per* ell Engliſh; what coſt a piece of that Cloth? *Anſw.* 11 *l.* 3 *s.* 8 *d.* 3 *qrs.* $\frac{94}{127}$.

93. The account of a certain School is as followeth; *viz.* $\frac{1}{16}$ of the Boys learn Geometry, $\frac{3}{8}$ learn Grammar, $\frac{3}{10}$ learn Arithmetic, $\frac{3}{20}$ learn to write, and 9 learn to read; I demand the number of each? *Anſw.* 5 *Geometers*, 30 *Grammarians*, 24 *Arithmeticians*, 12 *Writers, and* 9 *Readers.*

94. I have laid out for a Merchant 638*l.* 17*s.* 3*d*, he allows me $\frac{3}{4}$ *per cent.* before that I owed him 184 *l.* 17 *s.* 9 *d.* how much is he indebted to me? *Anſw.* 471 *l.* 10 *s.* 10 *d.* 1 *qr.*

95. Bought a tun of Wine for 78 *l.* 17 *s.* at what price muſt I ſell it *per* quart to gain 5 *l.* 10 *s.* by the whole, when there were 22 gallons leaked out? *Anſw.* 22 *d.* +

96. If out of 10 *s. per* week I lay up 4 *d.* 2 *qrs. per* day, Sundays excepted; and have ſaved 9 *l.* 2 *s.* 3 *d.* how long was I in laying it up; and how much have I ſpent in that time.

Anſw. { 567 *days in laying up.*
{ 31 *l.* 7 *s.* 9 *d. ſpent.*

97. If I buy 1000 ells Flemiſh of Linen for 90 *l.* what may I ſell it *per* ell in London to gain 10 *l.* by the whole? *Anſw.* 3 *s.* 4 *d. per ell.*

98. Bought threeſcore pieces of Holland for three times as many pounds, and ſold them again for four times as much; but if they had coſt me as much as I ſold them for, what ſhould I have ſold them for, to gain after the ſame rate? *Anſw.* 320*l.*

99. There are three quantities of Silver, each of the ſame weight, but different in value; the weight of each quantity is 10 *oz.* the value of the firſt ſort is 4 *s. per oz.* of the ſecond 4 *s.* 6 *d. per oz.* and of the third 5 *s. per oz.* I demand the worth of an *oz.* when they are all melted down together? *Anſw.* 4 *s.* 6 *d. per oz.*

100. I have received advice from my Factor, that he has diſburſed upon my account, the ſum of 4000 Guilders, 15 Stivers; I demand what ſum I muſt anſwer for that in Engliſh money, exchange at par; and alſo what his commiſſion comes to at 2 *per cent.*?

Anſw, { 400 *l.* 1 *s.* 6 *d. Sterling.*
{ 8 *l,* 0 *s,* 0 *d,* 1 *qr, Commiſſion.*

101. A Merchant bought a parcel of Jewels for 220 *l.* and ſold them again for 440 *l.* payable at the end of 6 months; I demand what the gain was worth in ready money; rebate being made at 6 *per cent.*? *Anſw.* 213 *l.* 11 *s.* 10 *d.*

102. A Factor bought 4 cheſts of Sugar, the mark and weight as follows;

	C.	*qrs.*	*lb.*
A - - - -	10	3	14
B - - - -	12	1	17
C - -	13	1	19
D - - - -	11	2	10

now ſuppoſe the tare or weight of every cheſt, when it is empty, to be 38 *lb.* I demand the neat weight of the ſaid Sugar; alſo I demand the prime coſt of the ſame, ſuppoſing it came to 18 *s. per C.* including the charges of lighterage, porterage, warehouſe-room, cuſtom, *&c.* alſo I demand the whole gain, and the gain *per cent* ſuppoſing the cheſts A and B were ſold afterwards at 28 *s. per C.* and the other two cheſts, *viz.* C and D, at 4 *d. per lb*

		l.	*s.*	*d.*
Anſw.	*Prime Coſt* - - -	42	4	8½
	Whole Gain - -	34	16	4½
	Gain per Cent. -	82	8	9½

103. A Gentleman a Chaiſe did buy,
An Horſe and Harneſs too;
They coſt the ſum of threeſcore Pounds,
Upon my word 'tis true;
The Harneſs came to half of th' Horſe,
The Horſe twice of the Chaiſe;
And if you find the price of them,
Take them and go your ways.

Anſw.	*Chaiſe* - - - -	15 *l.*
	Horſe - -	30 *l.*
	Harneſs - -	15 *l.*

104. A Gentleman courted a young Lady, and as their birthdays happened together, they agreed to make that their wedding-day. On the day of marriage, it happen'd, that the Gentleman's age was juſt double to that of the Lady's, that is, as 2 to 1. After they had lived together 30 years, the Gentleman obſerved that his Lady's age drew nearer to his, and that his was only in ſuch proportion to hers as 2 to 1 $\frac{3}{7}$. thirty years after this, the ſame Gentleman found his and his Lady's ages to be as near as 2 to 1 $\frac{3}{5}$; at which time they both died. I demand their ſeveral ages at the day of their marriage and of their death; alſo the reaſon why the Lady's age, which was continually gaining upon her Huſband's, ſhould, notwithſtanding be never able to overtake it?

A Short COLLECTION *of Pleaſant and Diverting* QUESTIONS.

1. A General having a Caſtle, ſituate on a Square, and garriſon'd by 48 Soldiers, ſo ordered them, as that any two Corners and the Side between them ſhould conſiſt of 18 Men; but he thinking there were not Men enow, hired 8 more, but ſtill kept up the ſame Number of 18 Men as before, afterwards 16 Men were paid off, he not having occaſion for them; but yet he kept up his Number of 18 Men; I demand how he muſt place the ſaid Men, to make 18 every Way, when he had 48, 56, and 40 Soldiers.

2. A poor Woman carrying ſome Eggs to Market, met with a rude Fellow who broke them all; but preſently after conſidering what he had done, went back and told the Woman he was willing to make Satisfaction, provided ſhe cou'd tell how many there were; ſhe, anſwered, ſhe could not tell, but the beſt Account that ſhe could give, was, that when ſhe told them in by two at a Time, there was one left, when by three, there was one left, and when by four, there was one left; but when ſhe told them in by five, there was none left: I demand how many Eggs the Woman had?

3. A Gentleman's Servant went to Market with an Order to buy 20 Fowls for 20 d. he did ſo, and brought home Pigeons at 4 d. a piece, Larks at a Halfpenny a piece, and Sparrows at a Farthing a piece: I demand how many there were of each ſort?

4. Suppoſe the 9 Digits to be placed in a quadrangular Form; I demand in what Order they muſt ſtand, that any three Figures in a right Line may make juſt 15?

5. Let 12 be ſet down in four Figures, and let each Figure be the ſame.

6. A Countryman having a Fox, a Gooſe, and a Peck of Corn, in his Journey came to a River, where it ſo happeened that he could carry but one over at a Time. Now, as no two were to be left together that might deſtroy each other; ſo he was at his Wits end how to diſpoſe of them: For, ſays he, Tho' the Corn can't eat the Gooſe, nor the Gooſe eat the Fox, yet the Fox can eat the Gooſe, and the Gooſe eat the Corn. The Queſtion is, how he muſt carry them over that they might not devour each other?

7. Three jealous Huſbands with their Wives, being ready to paſs by Night over a River, do find at the Water ſide a Boat which can carry but two Perſons at once, and for want of a Waterman, they are neceſſitated to row themſelves over the River at ſeveral Times: The Queſtion is, how theſe 6 Perſons ſhall paſs by 2 and 2, ſo that none of the three Wives may be found in the Company of 1 or 2 Men, unleſs her Huſband be preſent? WINGATE.

8. Two merry Companions are to have equal Shares of 8 Gallons of Wine, which are in a Veſſel containing exactly 8 Gallons. Now to divide it equally between them, they have only two other empty Veſſels, of which one contains 5 Gallons, and the other 3; the Queſtion is, how they ſhall divide the ſaid Wine between them by the Help of theſe three Veſſels, ſo that they may have 4 Gallons a piece? WINGATE.

9. Says Jack to his brother Harry, I can place four Threes in ſuch manner that they ſhall make juſt 34; can you do ſo too?

THE
Schoolmaſters Aſſiſtant.

PART V.

Of DUODECIMALS.

Q. *WHAT are Duodecimals?*

A. They are Fractions of a Foot, or of an Inch, or any Part of an Inch, having 12 for their Denominator.

NOTATION of DUODECIMALS.

Q. *HOW do you write Duodecimals?*

F. I. ″. ‴. ⁗.
A. Thus; 3 7 2 3 7, *&c.*

Q. *How do you read them?*

A. Thus; 3 Feet, 7 Inches, 2 Seconds, 3 Thirds, 7 Fourths, *&c.*

Note 1. Some call the Inches Primes, and mark them thus, 7′.

2. Tho' this manner of dividing and ſubdividing a Foot is endleſs, yet it is ſo only in imagination and cannot be reduced to Practice, becauſe a Second, or a twelfth part of an Inch is ſo ſmall, as to be incapable of any further Diviſion.

ADDITION of DUODECIMALS.

Note, 12 Fourths make 1 Third.
12 Thirds — 1 Second.
12 Seconds — 1 Inch.
12 Inches — 1 Foot.

EXAMPLES.

F.	*I.*	*″.*	*‴.*	*⁗.*
14	4	3	5	6
17	10	11	10	4
16	3	7	5	8
19	1	10	11	11
19	3	5	7	11
46	4	9	10	6

F.	*I.*	*″.*	*‴.*	*⁗.*
28	4	3	7	10
36	10	3	11	5
19	10	4	7	6
39	5	6	9	4
47	6	2	10	11
92	11	10	3	7

A Joiner having finiſhed ſeveral very curious Pieces of Workmanſhip would know the Content of the whole: Now the firſt Piece meaſured ſeventeen Feet, ten Inches, two Seconds and one Third; the ſecond meaſured twenty Feet, four Inches, and ſeven Thirds; the third forty-nine Feet ſix Inches, and nine Seconds; the fourth fourſcore Feet, and ten Seconds; the fifth ſeventeen Feet and four Thirds; the ſixth threeſcore Feet and ten Seconds; and the ſeventh thirty-ſeven Feet, and nine Thirds; What was the Content in Square Meaſure?

SUBTRACTION *of* DUODECIMALS.

EXAMPLES.

	F.	*I.*	″.	‴.	⁗.
From	74	3	4	7	6
Take	19	4	8	8	10

F.	*I.*	″.	‴.	⁗.
100	5	7	3	1
97	8	9	10	11

A Joiner having lined ſeveral Rooms, very curiouſly, with Cedar, finds the Amount to be, in Square Meaſure, 800*f.* 3*i.* 4″, but ſeveral Deductions being to be made for Windows, Arches, *&c.* thoſe Deductions amounted to 70*f.* 3*i.* 7″. 10‴. 5⁗. how many Feet of Workmanſhip muſt he be paid for?

MULTIPLICATION *of* DUODECIMALS, *commonly called* CROSS MULTIPLICATION.

Note, Feet multiplied by Feet give Feet.
Feet Multiplied by Inches give Inches.
Feet multiplied by Seconds give Seconds.
Inches multiplied by Inches give Seconds.
Inches multiplied by Seconds give Thirds.
Seconds multiplied by Seconds give Fourths, &c.

EXAMPLES. 1. *Of Feet and Inches.*

	F.	*I.*	
Multiply	7	3	
By	4	7	
	29	0	″
	4	2	9
Product	33	2	9

1. Here I multiply the 7*f.* 3*in.* firſt by 4 Feet (which gives Feet and Inches for the Product) ſaying 4 times 3 is 12, ſet down 0 and carry 1; then 4 times 7 is 28 and 1 is 29, which ſet down.

2. Next I multiply the ſame 7*f.* 3*in.* by 7 Inches (which give Inches and Seconds for the Product) ſaying 7 times 3 is 21, ſet down 9 Seconds and carry 1 Inch; then 7 times 7 is 49 and 1 is 50 Inches, or 4 Feet 2 Inches, which ſet down; then add them together, and the whole is 33*f.* 2 *in.* 9 *ſec.*

	F.	*I.*		*F.*	*I.*		*F.*	*I.*		*F.*	*I.*	
Multiply	7	5		4	6		9	7		8	3	
By	3	9		5	8		9	7		6	4	
Product	27	9	9	25	6		91	10	1	52	3	

	F.	*I.*		*F.*	*I.*		*F.*	*I.*	
Multiply	4	7		3	8		9	7	
By	5	10		7	6		3	6	
Product	26	8	10	27	6		32	6	6

	F.	*I.*		*F.*	*I.*		*F.*	*I.*	
Multiply	3	11		6	5		7	10	
By	9	5		7	6		8	11	
Product	36	10	7	48	1	6	69	10	2

The truth of any one of theſe Operations, may be proved by reducing the Factors into Inches, and dividing their Product by 144 the Number of ſquare Inches in a Foot ſquare, the Quotient will be the Anſwer, *viz.*

First Sum.

1. *By whole Numbers.*

F.	*I.*		*I.*
7	3	=	87
4	7	=	55

435
435

144)4785(33
432

465
432

33
12

144)396(2
288

108
12

144)1296(6
1296

0

2. *By Vulgar Fractions.*

F.
Multiply $7\frac{3}{12}$
By $4\frac{7}{12}$

$$\frac{87}{12}\times\frac{55}{12}=\frac{4785.}{144}$$

Then divide the Numerator by the Denominator as before.

3. *By Decimals.*

Mult. 4.5833+
By 7.25

229165
91666
320831

33.228925
12

2.747100
12

8.9652

F. *I.* ″.
Facit 33 2 9 *nearly.*

Note, When the Number of Feet happens to be large in either or both of the Factors, inſtead of multiplying by Inches (if any be) you may take parts with them.

EXAMPLES.

	F. *I.*	*F.* *I.*	*F.* *I.*
Multiply	76 7	46 7	71 7
By	48 9	39 8	84 6
76 + 8 =	608	1847 9 8	6048 9 6
76 + 4 =	304	*F.* *I.*	*F.* *I.*
48 = 7 =	28 ‴.	76 7	36 1
6½	38 3 6	19 10	18 8
3½	19 1 9		
Product	3733 5 3	1518 10 10	673 6 8

Multiply

	F.	I.	
Multiply	84	3	
By	95	2	
Product	8017	9	6

F.	I.	
48	7	
26	8	
1295	9	8

F.	I.	
79	8	
38	11	
3100	4	4

	F.	I.	
Multiply	127	6	
By	184	8	
Product	23545	0	

F.	I.	
767	5	
198	3	
152140	4	3

F.	I.	
7691	10	
1976	11	
15206113	6	2

2. *Of Feet, Inches, and Seconds.*

	F.	I.	".		
Multiply	7	3	2		
By	1	7	3		
	7	3	2	‴.	
	4	2	10	2	⁗.
		1	9	9	6
Product	11	7	9	11	6

F.	I.	".	
8	6	9	
7	3	8	
62	6	7	9

F.	I.	".	
3	10	6	
7	4	8	
28	7	7	

F.	I.	".		
7	1	9		
7	8	9		
55	2	9	3	9

F.	I.	".		
3	8	4		
3	9	2		
13	10	10	4	8

F.	I.	".		
9	8	7		
12	3	10		
119	8	2	10	10

F.	I.	".		
9	8	7		
6	5	4		
62	7	3	9	4

F.	I.	".		
3	2	1		
2	3	4		
7	2	8	11	4

F.	I.	".		
5	6	7		
8	9	10		
48	11	2	8	10

Note, If the Number of Feet is large, inſtead of multiplying by Inches and Seconds, you may take parts with them.

EXAMPLES.

I.	*F.*	*I.*	″.		
6⅓)	76	3	9		
	84	7	11		
76 × 4 =	304	0	0		
76 × 8 =	608	0	0		
3 × 84 =	21	0	0		
9 × 84 =	5	3	0	‴.	
I. 1⅙)	38	1	10	6	
″. 6½)	6	4	3	9	⁗.
3½)	3	2	1	10	6
2⅓)	1	7	0	11	3
	1	0	8	7	6
	6460	7	1	8	3

F.	*I.*	″.		
87	3	4		
18	1	7		
1582	6	2	3	

F.	*I.*	″.		
64	3	7		
27	2	6		
1749	5	5	11	6

F.	*I.*	″.		
49	3	1		
48	1	2		
2369	1	5	7	2

F.	*I.*	″.		
71	3	6		
92	1	7		
6568	2	10	6	6

F.	*I.*	″.	
71	2	6	
81	1	8	
5777	9	2	2

F.	*I.*	″.	
56	1	8	
97	3	9	
5463	0	2	3

F.	*I.*	″.	
756	1	8	
184	2	6	
139287	1	0	2

F.	*I.*	″.		
371	2	6		
181	1	9		
67242	10	1	4	6

F.	*I.*	″.		
487	11	10		
186	10	11		
91209	4	2	2	2

A DECIMAL TABLE *of* INCHES *and* SECONDS.

I. S.	Decimals.	I. S.	Decimals.	I. S.	Decimals.	I. S.	Decimals
1	.006944	1 1	.090277	2 1	173611	3 1	.256944
2	.013888	2	.097222	2	.180555	2	.263888
3	.020833	3	.104166	3	.1875	3	.270833
4	.027777	4	.111111	4	.194444	4	.277777
5	.034722	5	.118055	5	.201388	5	.284722
6	.041666	6	.125	6	.208333	6	.291666
7	.048611	7	.131944	7	.215277	7	.298611
8	.055555	8	.138888	8	.222222	8	.305555
9	.0625	9	.145833	9	.229166	9	.3125
10	.069444	10	.152777	10	.236111	10	.319444
11	.076388	11	.159722	11	.243055	11	.326388
1 0	.083333	2 0	.166666	3 0	.25	4 0	.333333
I. S.	Decimals	I. S.	Decimals.	I. S.	Decimals	I. S.	Decimals.
4 1	.340277	5 1	.423611	6 1	.506944	7 1	.590277
2	.347222	2	.430555	2	.513888	2	.597222
3	.354166	3	.43765	3	.520833	3	.604166
4	.361111	4	.444444	4	.527777	4	.611111
5	.368055	5	.451388	5	.534722	5	.618055
6	.375	6	.458333	6	.541666	6	.624999
7	.381944	7	.465277	7	.548611	7	.631944
8	.388888	8	.472222	8	.555555	8	.638888
9	.395833	9	.479166	9	.5625	9	.645833
10	.402777	10	.486111	10	.569444	10	.652777
11	.409722	11	.493055	11	.576388	11	.659722
5 0	.416666	6 0	.5	7 0	.583333	8 0	.666666
I. S.	Decimals	I. S.	Decimals	I. S.	Decimals	I. S	Decimals.
8 1	.673611	9 1	.756944	10 1	.840277	11 1	.923611
2	.680555	2	.763888	2	.847222	2	.930555
3	.6857	3	.770833	3	.854166	3	.9375
4	.694444	4	.777777	4	.861111	4	.944444
5	.701388	5	.784722	5	.868055	5	.951388
6	.708333	6	.791666	6	.874999	6	.958333
7	.715277	7	.798611	7	.881944	7	.965277
8	.722222	8	.805555	8	.888888	8	.972222
9	.729166	9	.8125	9	.895833	9	.979166
10	.736111	10	.819444	10	.902777	10	.986111
11	.743055	11	.826388	11	.909722	11	.993055
9 0	.75	10 0	.833333	11 0	.916666	12 0	1.

The Conſtruction of the foregoing TABLE.

Let it be required to find what part of a Foot one Second is in Decimals.

1. One Foot reduced into Seconds, makes 144 Seconds.
2. The vulgar Fraction will then be $\frac{1}{144}$ of a Foot.
3. Divide the upper Term by the lower, and the Quotient thence ariſing will be the Anſwer.

```
144)1.000000(.006944+
      864
      ----
      1360
      1296
      ----
       640
       570
       ----
        640
        576
        ---
         64
         --
```

After the ſame Manner the whole Table is made, except in the Caſe of Inches only: as in the Caſe of one Inch, where the Vulgar Fraction will be $\frac{1}{12}$ of a Foot. Divide the upper Term by the lower, as before, and you have the Quotient for the Anſwer.

```
12)1.000000(.083333+
           4
```

Note 1. If the given part of a Foot conſiſt only of Inches, the Diviſor need be no more than 12, becauſe 12 Inches make 1 Foot.

2. If the given part of a Foot conſiſt of Seconds only, or Inches and Seconds together, then 144 muſt be the Diviſor, becauſe 144 Seconds make 1 Foot.

The Uſe of the foregoing TABLE.

Let the firſt Example in Multiplication be given, *viz.*

F. *I.*
Multiply 7 3
By 4 7

Look in the Table for 3 Inches, againſt which ſtands .25 —Again, look for 7 Inches, againſt which ſtands .583333 —Hence it follows, that 7 *f.* 3 *in.*=7.25 *f.* and 4 *f.* 7 *in.* =4.583333 *f.*

Note, It is common in any large Number of Decimals, to ſave trouble in the Operation, by making one of them one Part larger, which cuts off all the following Figures; thus 4.583333 f. may be made 4.584 f.

F.
Multiply 7.25
By 4.584

2900
5800
3625
2900

33.23400
12

2.808
12

9.696

F. *I.* ″.
Anſw. 33 2 9

Again; let the firſt Example in Feet, Inches and Seconds be given, *viz.*

F. *I.* ″.
Multiply 7 3 2
By 1 7 3

Look in the Table for 3 *i.* 2 *ſ.* and againſt them you will find .263888; alſo look, in the ſame Table, for 7 *i.* 3 *ſ.* and againſt them you will find .604166: Then, by ſhortening the Decimals,

Multiply 7.264
By 1.6041

7264
29056
43584
7264

11.6521824
12

7.82616
12

9.91392
12

10.96704
12

11.60448

F. I. ". ‴. ⁗.
Anſw. 11 7 9 10 11 *the Difference being inconſiderable.*

DIVISION *of* DUODECIMALS.

	F.	I.	".	F.	I.	".
2)	146	7	10(	73	3	11
3)	761	4	11(			
4)	963	2	10(			
5)	186	1	10(			
6)	76	3	11(			
7)	186	1	10(			
8)	712	8	4(			
9)	812	3	5(			
10)	861	11	10(			

	.F	I.	".		
11)	123	4	5(		
12)	76	8	7(	‴	⁗
7)	86	3	7	4	8(
8)	98	4	6	9	1(
9)	86	2	1	1	7(
10)	47	3	4	6	1(
11)	96	2	7	11	4(
12)	83	1	6	9	10(
12)	78	10	11	10	9(

Note 1. It very ſeldom happens that the Diviſor conſiſts of more than one Denomination : Yet becauſe ſuch Diviſors may ſometimes offer themſelves, I will give a few for the Reader's ſatisfaction, which muſt be wrought after the manner of Long Diviſion, and may ſerve alſo as Proofs to ſome of the foregoing Examples in Multiplication.

2. This ſort of Diviſion often admits of two Figures at once in the Quotient.

EXAM-

EXAMPLES.

F. *I.* *F.* *I.* *"* *F.* *I.*
4 5)33 1 6(7 6
4 5 × 7 = 30 11

2 2 6
4 5 × 6 = 2 2 6

0

Note, If the Feet in the Quotient conſiſt of more than one Figure, you muſt conſider,

1. How many Figures are required in the Feet by common Diviſion.

2. If the Feet required conſiſt only of two Figures, you muſt multiply the Diviſor by the firſt Figure (which ſtands in tens Place) with a Cypher annexed. But,

3. If the Feet required conſiſt of three Figures, you muſt multiply the Diviſor by the firſt Figure (which ſtands in Hundreds Place) with two Cyphers annexed; and the next Figure in the Quotient (which ſtands in tens Place) with one Cypher annexed.

4. Whatever the Product is in Feet and Inches, let it be placed under the Dividend, in ſuch manner, that Feet and Inches may ſtand under Feet and Inches, and Units under Units.

5. With regard to the Number of Feet in the Dividend, you muſt proceed according to the common Method of Long Diviſion, 'till you have obtained the Number of Feet required in the Quotient.

F. *I.* *F.* *I.* *".* *F.* *I.*
184 8)235.45 0 0(127 6
184 8 × 100 = 184.66 8

507.8 4
184 8 × 10 = 369.3 4

1385 0
184 8 × 7 = 1292 8

92 4 0
184 8 × 6 Inches = 92 4 0

0

F. *I.* *F* *I.* *".* *F.* *I.*
48 9)3733 5 3(76 7
48 9 × 70 = 3412 6

320 11
48 9 × 6 = 292 6

28 5 3
48 9 × 7 *Inch.* = 28 5 3

0

```
                      F.   I.  F.   I.  ". F.  I.
                      79   8)3100   4   4(38   11
     79 8 × 30      = 2390
                      ---------
                       710  4
     79 8 × 8       =  637  4
                       ----------
                        73  0  4
     79 8 × 11 In.  =   73  0  4
                        --------
                               0
                        --------
```

```
F.   I. F.   I.  ".          F.   I.  F.    I.   ".
 6   7) 31   3   3(          39   8)1847    9    8(
 8  10) 87   7   2(          84   6)6048    9    6(
 8   9) 83  10   3(          19  10)1518   10   10(
12   9)130   8   3(          95   2)8017    9    6(
11   5)140   9   8(          26   8)1895    6    8(
 9   3)116   4   9(          18   8) 673    6    8(
```

```
   F. I. ".  F.  I. ". ‴. ⁗. F. I. ".
   1  7  3)11  7  9  11  6(7  3  2
           11  2  9
           ---------
               5  0 11
               4  9  9
               ---------
                  3  2  6
                  3  2  6
                  -------
                        0
                  -------
```

```
F. I. ". F.  I. ". ‴. ⁗. F. I. ".  F.  I. ". ‴. ⁗.
7  3  8)62   6  7  9(  12  3 10) 119  8  2 10 10(
3 10  6)28   7  7  0(   9  8  7)  62  7  3  9  4(
7  1  9)55   2  9  3 9( 3  2  1)   7  2  8 11  4(
3  9  2)13  10 10  4 8( 8  9 10)  48 11  2  8 10(
```

F I N I S.